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Toxicological Profiles Report

Tennessee Valley Authority
Ash Recovery Project
Kingston, Tennessee

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ARCADIS

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List of Acronyms

AhR	aryl hydrocarbon receptor
AVS	acid-volatile sulfide
BCF	bioconcentration factors
BERA	Baseline Ecological Risk Assessment
BLM	biotic ligand model
bw	body weight
bw/d	body weight per day
Cr^{+3}	trivalent chromium
Cr^{+6}	hexavalent chromium
dw	dry weight
EC_{50}	effect concentration to 50 percent
Eh	redox potential
FCV	Final Chronic Values
HMW	high molecular weight
LC_{50}	lethal concentration to 50 percent
LD_{50}	lethal dose to 50 percent
LMW	low molecular weight
LOAELs	low observed adverse effect level
µg/L	micrograms per liter
µmol/g	micromoles per gram
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MMA (V)	monomethylarsonic acid
NOAELs	no observed adverse effect level
PAH	polycyclic aromatic hydrocarbon
PCBs	polychlorinated biphenyls
ppb	parts per billion
ppm	parts per million
SAS	synthetic amorphous silica
SEM	simultaneously extracted metals
TRVs	toxicity reference values
USEPA	U.S. Environmental Protection Agency
WOE	weight of evidence
ww	wet weight

1. Introduction

This document presents toxicological profiles of the chemicals of potential ecological concern associated with a major fly ash spill into the Emory River following the failure of a dike at the Tennessee Valley Authority's Kingston Fossil Plant in Kingston, Tennessee, in late December 2008. ARCADIS has prepared this document in support of the Baseline Ecological Risk Assessment (BERA) being conducted to investigate potential ecological impacts.

The potential impacts of the fly ash spill will be evaluated through a weight of evidence (WOE) approach based on numerous lines of evidence including bulk sediment and porewater data, surface-water data, toxicity tests, measures of bioaccumulation in key receptor species, as well as population and community measures. A full description of the various assessment and measurement endpoints is provided in the BERA methodology in the approved *Sampling and Analysis Plan* (Jacobs 2010). As part of this WOE, exposure-response data reported in the scientific literature will be used as a primary line of evidence for characterizing risks to ecological receptors. This includes the comparison of: 1) constituent concentrations in ambient media [sediment, sediment porewater, and surface water (epibenthic and water column)] to no observed adverse effect level (NOAELs), low observed adverse effect level (LOAELs), and chronic values; 2) body burden effects data (whole or organ) with toxicity data found in the literature; and 3) measured or estimated concentrations in prey and in incidentally ingested ambient media with dietary based toxicity reference values (TRVs). The purpose of these toxicological profiles is to provide an overview of the general toxicity information from the scientific literature that will be used to develop these comparisons.

For metals in particular, there are some principles that can be applied across a group of chemicals. For example, equilibrium partitioning theory predicts that some metals partition in sediment between acid volatile sulfides (AVS) (principally monosulfides), interstitial (pore) water, benthic organisms, and other sediment phases such as particulate organic carbon and iron and manganese oxides (Ankley et al. 1996). Cadmium, copper, lead, nickel, silver, and zinc are some of these simultaneously extracted metals (SEM), (extracted along with AVS in mild acid at room temperature) that can interact with AVS, forming insoluble cadmium sulfide that has limited bioavailability to benthic aquatic organisms (USEPA 2005). AVS may also bind other SEM that may have a higher affinity for sulfides; thus, ΣSEM in relation to AVS, rather than the metal concentration alone, is considered when predicting the toxicity of sediments. If ΣSEM/AVS is less than 1, toxicity due to the SEM metals is not expected. Similarly, toxicity is not expected when organic carbon-normalized excess ΣSEM is less than 130 micromoles per gram (μmol/g) organic carbon (USEPA 2005).

Similarly, the biotic ligand model (BLM) evaluates metal speciation and cation competition, including the formation of complexes with inorganic, organic, and biotic ligands, to predict the bioavailability and toxicity of metals (Di Toro et al. 2001; USEPA 2007). A biotic ligand is a receptor or site of action on the receptor (e.g., fish gill) where accumulation of metal leads to toxicity. The BLM can estimate metal accumulation at

this site under various chemical conditions; then, by relating metal accumulation to effects, the BLM can be used to predict the toxicity of metals such as cadmium, copper, lead, nickel, silver, and zinc to aquatic organisms (Santore et al. 2002).

For the purpose of this report, we have attempted to identify both initial screening values that can be used to focus the investigation on those chemicals most likely to be driving risks, as well as other relevant data that will be used to develop more specific values once the primary risk drivers are identified. For constituents in sediment and surface water, initial screening values based on relevant surface-water criteria and sediment benchmarks are presented (Table 1) for the purpose of focusing the investigation on key risk drivers. Sediments will be further assessed using equilibrium partitioning sediment benchmarks derived from aqueous effects values and measured organic carbon content for nonionic organics [U.S. Environmental Protection Agency (USEPA)] and AVS for metals (USEPA). Measured concentrations of parent and alkylated polycyclic aromatic hydrocarbons (PAHs) will be evaluated using USEPA's procedure for PAH mixtures in sediment (USEPA 2003). Preliminary screening values have also been developed for the dietary TRVs (Table 2). In addition to these screening values, LOAELs, NOAELs, and chronic values for survival, growth, or reproduction associated with the various exposure pathways are provided for plants (Appendix A), benthic invertebrates (Appendix B), fish (Appendix C), amphibians and reptiles (Appendix D), birds (Appendix E) and mammals (Appendix F). These data are intended to reflect the overall range of values that will be considered in developing toxicological endpoints for each line of evidence; refinements will be made as the constituent of potential concern list is narrowed for each specific group of receptors. Primary emphasis has been placed on identifying these toxicological data, however, a general overview of the sources, environmental fate, and bioaccumulation potential of each chemical is also provided below.

2. Aluminum

2.1 Overview

Aluminum is the most abundant metal in the earth's crust. It is found in the air, soil, and water and is present in nearly all foods. Aluminum is very reactive and thus is typically found combined with other elements, usually oxygen, silicon, and fluorine. These compounds are commonly found in soil, minerals, rocks, and clays. Metallic aluminum has many uses in industry, including beverage cans, pots and pans, airplanes, siding and roofing, and aluminum foil. It is also commonly used in explosives and fireworks. Aluminum containing compounds are used in industrial applications as aluminum sulfate in water treatment and alumina in abrasives and furnace linings. It is also found in consumer products including antacids, astringents, buffered aspirin, food additives, antiperspirants, and cosmetics (ATSDR 2008).

Aluminum is ubiquitous in the environment but elevated concentrations may be found due to anthropogenic sources including mining and processing of aluminum ores, the production of aluminum metal, alloys, and compounds, or as a result of coal combustion (ATSDR 2008). Deposition of aluminum can occur due to windborne soil particles. Generally, aluminum and aluminum containing compounds do not readily dissolve in water except under high acidity or alkalinity. The solubility and mobility of aluminum in soil is generally greatest when the soil is rich in organic matter capable of forming dissolved aluminum-organic complexes and under low pH, such as in areas prone to acid rain or in acidic mine tailings (ATSDR 2008).

2.2 Environmental Fate and Transport

Aluminum is released to the environment by both natural processes and anthropogenic sources. Because of its prominence as a major constituent of the earth's crust, natural processes far exceed the contribution of anthropogenic releases to the environmental distribution of aluminum (Lantzy and MacKenzie 1979). Although aluminum has four oxidation states (0, +I, +II, and +III), it is found in the +III oxidation state in the environment (Lide 2005); and it does not normally undergo oxidation-reduction reactions. Its behavior in the environment is strongly influenced by its coordination chemistry, and it partitions between solid and liquid phases by reacting and complexing with water molecules and anions such as chloride, fluoride, sulfate, nitrate, phosphate, and negatively-charged functional groups on humic materials and clay.

Anthropogenic releases are primarily to the atmosphere. The largest source of airborne aluminum-containing particulates is the flux of dust from soil and the weathering of rocks (Lee and Von Lehmden 1973; Sorenson et al. 1974). In addition, aluminum-containing dust is generated by volcanic activity (Varrica et al. 2000). Human activities, such as mining and agriculture, contribute to this wind-blown dust (ATSDR 2008), which accounts for approximately 13 percent of total atmospheric aluminum (Lantzy and MacKenzie 1979). The major anthropogenic sources of aluminum-containing particulate matter include coal combustion,

aluminum production, and other industrial activities, such as smelting, that process crustal minerals (Lee and Von Lehmden 1973).

In surface waters, aluminum occurs ubiquitously as a result of the weathering of aluminum-containing rocks and minerals. Aluminum is commonly mobilized from terrestrial to aquatic environments as a result of environmental acidification (Campbell et al. 1992). Aluminum concentrations in surface waters can be increased directly or indirectly by human activity through industrial and municipal discharges, surface runoff, tributary inflow, groundwater seepage, and wet and dry atmospheric deposition (Eisenreich 1980). Episodic mobilization is commonly associated with pH depressions occurring during spring snowmelt or specific storm events (Campbell et al. 1992; Nelson and Campbell 1991; Rosseland et al. 1990).

Aluminum can be released naturally by the weathering of aluminum-containing rocks, but is also commonly released due to its presence in many mining wastes (DOI 1983, 1984).

2.3 Uptake and Bioaccumulation

Aluminum accumulation in organisms is a function of water-quality parameters, including pH and dissolved organic carbon concentration (Cleveland et al. 1989). Aluminum does not bioconcentrate appreciably in fish (Rosseland et al. 1990). Accumulation of aluminum in brook trout has been shown to be higher at lower pHs (Cleveland et al. 1989). In studies on Atlantic salmon, Wilkinson and Campbell (1993) reported that gill uptake was slow, and the greatest fraction of the gill-associated aluminum was not sorbed to the gill tissue, but rather to the gill mucus.

Invertebrate bioaccumulation of aluminum has been reported for multiple freshwater species. Crayfish have been found to contain high tissue concentrations of aluminum relative to control when collected from roadside drainage ditches in Louisiana (Magidosky et al. 1991).

Different plant species have substantially different uptake rates for translocation of aluminum to aboveground tissues, and aluminum is often concentrated in root tissue (Kabata-Pendias and Pendias 1984). Research has shown that in Douglas fir, large root biomass takes up and immobilizes aluminum, preventing its accumulation in aboveground tissues (Vogt et al. 1987).

2.4 Toxicity

The effects of aluminum on natural resources are strongly influenced by interactions with the surrounding matrix, with soluble aluminum (Al^{+3}) likely associated with the greatest impacts. Effects noted for various receptor groups include: decreased height and weight yields in plants; acute toxicity and reduced survival and reproductive output in some freshwater invertebrates; mortality and reduced weight in fish; and impaired breeding, including small clutch size, and defective eggshell formation in birds. However,

although aluminum has been extensively studied, many of the toxicity tests performed have been conducted under laboratory conditions and/or with aluminum-containing salts and therefore may not provide an accurate representation of toxicity under actual site-specific conditions.

3. Antimony

3.1 Overview

Antimony is a metalloid that occurs naturally in the earth's crust both as an uncombined metal and in over 100 minerals. Antimony for human use is mined, produced as a byproduct of lead smelting, or derived from secondary scrap sources. Metallic antimony is alloyed with lead and other metals for use in lead acid storage batteries, solder, and other materials. Antimony trioxide is frequently used as a fire retardant (ATSDR 1992). Antimony is also used in diverse nonmetal products, such as enamels and pigments (ATSDR 1992).

Antimony and its compounds are released to the environment from both natural and anthropogenic sources; however, anthropogenic contributions are generally greater (ATSDR 1992). Natural sources include windblown dust, volcanic emissions, ocean spray, forest fires, and biogenic sources. Anthropogenic releases of antimony result from the industrial manufacture, processing, and use of antimony. Most anthropogenic releases are to land, followed by air, water, and underground injection. Antimony released to air is released primarily from metal mines, smelters, and refineries; coal fired power plants; and refuse incinerators, where antimony volatilizes during combustion and condenses on fine suspended particulates that can be transported long distances (ATSDR 1992).

3.2 Environmental Fate and Transport

Antimony occurs in four oxidation states, of which the latter two are most common and stable: -III, 0, +III, and +V (ATSDR 1992). Antimony cations are not found in solution, but trivalent antimony in the form of $Sb(OH)_3$ and pentavalent antimony in the form of $Sb(OH)_6^-$ are the dominant hydrolyzed forms at typical natural pH ranges (ATSDR 1992). Trivalent antimony dominates under reducing conditions and in anaerobic waters. Pentavalent antimony dominates under oxidizing conditions at a pH above 3 and in aerobic freshwater and saltwater. In anaerobic sediment, certain microorganisms can reduce and methylate antimony and release the resulting volatile compounds into the water (ATSDR 1992). Typical concentrations of antimony in ambient water are too low for antimony trioxide or antimony pentoxide to precipitate (ATSDR 1992). Antimony may form complexes with sulfur (ATSDR 1992) and with inorganic and organic acids, resulting in compounds such as antimony potassium tartrate (ATSDR 1992).

Antimony occurs naturally in soil at very low concentrations. The adsorption of antimony to solid media is not well understood. Some data indicate that antimony can be strongly adsorbed to soil (ATSDR 1992), especially colloidal material (ATSDR 1992), and that adsorption is correlated mainly with concentrations of iron, manganese, and aluminum in soil or sediment (ATSDR 1992). However, other data suggest that antimony may be fairly mobile under a variety of environmental conditions (ATSDR 1992). Antimony is not

expected to sorb strongly to organic carbon (ATSDR 1992). Leaching experiments on coal ash and other materials have shown that antimony does not readily leach out of materials (ATSDR 1992).

Antimony is transported to waterways via natural weathering and runoff or via anthropogenic sources such as industry, domestic wastewater treatment, or waste leaching. Since most inorganic antimony compounds are not very soluble or may convert to insoluble forms in water (ATSDR 1992), antimony in water is typically associated with particulate matter, where active sedimentation zones act as sinks (ATSDR 1992).

3.3 Uptake and Bioaccumulation

Antimony has not been observed to bioaccumulate in terrestrial or aquatic organisms; however, the available database is limited. Bioconcentration was not detected during a 28-day test in bluegill sunfish (ATSDR 1992). A study of antimony in plants, invertebrates, voles, shrews, and rabbits around a smelter indicated that surface deposition, rather than the observed slight uptake from soil, contributed most to antimony found in plants, and that biomagnification through trophic levels was not occurring (ATSDR 1992).

The bioavailability of antimony from sediments has not been linked to AVS despite the fairly frequent association of antimony with sulfur compounds (e.g., occurrence in sulfide ores). With the exception of silver, divalent metals, rather than trivalent or pentavalent metals like antimony, are most typically analyzed in conjunction with AVS.

3.4 Toxicity

The toxicity of antimony is dependent on the form, with the trivalent form considered more toxic. However, the trivalent form has also been shown to be absorbed slowly when ingested. Some data suggest that aquatic plants may be more sensitive to antimony than invertebrates or fish, although variable sensitivities to antimony have been reported amongst different fish species

Very little data is available regarding antimony toxicity to plants or avian species. Damron and Wilson (1975) found no significant increase in mortality in Bobwhite quail consuming antimony in either food (3 percent and 6 percent in feed) or in lead shot containing antimony. Similarly, antimony potassium tartrate (also known as tartar emetic) is frequently used to obtain stomach contents in avian field studies and has been associated with only low mortality (~2 percent) and no detrimental effects (Poulin and Lefebvre 1995). However, in a study on little penguins (*Eudyptula minor*) (Montagu and Cullen 1985) found that there is only a small range where antimony tartrate is both effective and safe. In mammals, Tylenda and Fowler (2007) found that antimony is usually excreted from the system quickly via urine. However, it also tends to accumulate in lung tissue, causing respiratory irritation, lung tissue abnormalities, and possibly lung tumors. Antimony toxicity in mammals is marked by cardiotoxicity,

including myocardial degeneration, arterial hypotension, heart dysfunction, arrhythmia, and changes to electrocardiogram patterns.

4. Arsenic

4.1 Overview

Arsenic is a naturally-occurring element widely distributed in the earth's crust. Although it is classified chemically as a metalloid, it is commonly referred to as a metal. Most domestically produced arsenic is used in manufacturing pesticides, wood preservatives, and growth stimulants for plants and animals. Historically, arsenic was predominantly used as a pesticide on cotton fields and in orchards. Organic arsenic compounds such as cacodylic acid, disodium methylarsenate and monosodium methylarsenate are still used as pesticides, primarily on cotton (ATSDR 2007). Small amounts of elemental arsenic are also added to other metals to form metal mixtures or alloys for use in automobile batteries, semiconductors and light-emitting diodes (ATSDR 2007).

Most anthropogenic arsenic emitted to the atmosphere is associated with high temperature processes including fossil fuel combustion, smelting operations and refuse incineration (Coles et al. 1979; Pacyna 1987). Arsenic may enter the environment during the mining and smelting of ores containing metals such as copper and lead. Small amounts of arsenic may also be released from coal-fired power plants and incinerators because coal and waste products often contain arsenic. Volcanic eruptions are another source of arsenic.

4.2 Environmental Fate and Transport

In nature, arsenic is usually found combined with other elements such as oxygen, chlorine, and sulfur. Arsenic can exist in six oxidation states (-III, 0, +I, +II, +III, +V) in various inorganic and organic forms. Arsenic is released into the atmosphere primarily as arsenic trioxide or, less commonly, in one of several volatile organic compounds, mainly arsines. These compounds undergo partial to complete oxidation to the pentavalent state; therefore, in the environment arsenic is usually a mixture of the trivalent and pentavalent forms (ATSDR 2007).

In water, arsenic is subject to a number of complex transformations, including oxidation-reduction reactions, ligand exchange, precipitation and biotransformation (ATSDR 2007). The factors influencing these processes include redox potential (Eh), pH, metal sulfide and sulfide ion concentrations, iron concentrations, temperature, salinity, distribution and composition of biota, season and the nature and composition of the organic matter (ATSDR 2007). Its bioavailability and toxic properties can be significantly modified by numerous biological and abiotic factors that include the physical and chemical forms of arsenic tested, the route of administration, the dose, and the species of animal.

Inorganic species of arsenic tend to be the most common forms in aquatic environments. As(+V) (as various protonated forms of arsenate: AsO_4^{-3}) generally dominates in oxidizing environments such as surface water and As(+III) (as arsenite: as various protonated forms of AsO_3^{-3}) dominates in reducing conditions such as in

groundwater with high concentrations of arsenic. However, the reduction of arsenate to arsenite is slow, so arsenate can be found in reducing environments (ATSDR 2007). The main organic arsenic species in fresh water are monomethyl arsenic and dimethyl arsenic, but they are usually at lower concentrations than the inorganic forms (ATSDR 2007).

Arsenic in soil can be transported by wind or water (as runoff) or may leach into soil. As many arsenic compounds commonly partition into soil or sediment under oxidizing condition, leaching into soil does not typically transport arsenic to great depth (Moore et al. 1988). When applied as a pesticide onto agricultural soils, arsenic tends to concentrate and remain in upper soil layers for prolonged periods of time.

Arsenic in soil exists in various oxidation dates and chemical species depending on soil pH and oxidation-reduction potential. Under most environmental conditions, inorganic As(+V) exists predominantly as a mixture of arsenate ions ($H_2AsO_4^-$ and $HAsO_4^{-2}$) and inorganic As(+III) exists predominantly as H_3AsO_3 (ATSDR 2007). Soil characteristics, including pH, organic matter content, porosity, iron and aluminum oxide content, and cation exchange capacity were all assessed by regression analysis and the most influential parameter affecting arsenic adsorption was found to be iron content in soil (Janssen et al. 1997). Arsenic adsorbed to iron oxides may be released under reducing conditions, which can occur in flooding conditions (LaForce et al. 1998; McGeehan 1996). Microbial action can also mobilize arsenic (LaForce et al. 1998). Phosphate compounds can compete with arsenate for adsorption sites on soil particles dependent on pH (ATSDR 2007). In general, As(+V) predominates in aerobic soils, and As(+III) predominates in slightly reduced soils and sediments (ATSDR 2007). As(+III) tends to be more mobile while As(+V) usually remains bound to minerals, limiting mobility and bioavailability.

4.3 Uptake and Bioaccumulation

Arsenic can accumulate into organisms from the water, but there is no evidence of biomagnification (Woolson 1975; NAS 1977; NRCC 1978). Studies with radioactive arsenic in mussels indicated that accumulation potential varies with nominal concentrations, tissue types, age of mussel, temperature, and water-quality parameters (Unlu and Fowler 1979). Arsenate concentrations were higher as arsenic water concentrations increased, but the response was suppressed at high conditions. Generally, arsenic uptake and depuration was greater at increased temperatures.

In order for arsenic compounds to be absorbed by plants, arsenic must be in a mobile form in the soil solution. In terrestrial plants in locations where arsenic content is not particularly high (as in locations near smelters), arsenic is usually distributed throughout the plant body in nontoxic amounts (NAS 1977).

Bioconcentration factors for arsenic are relatively low for all organisms analyzed, with an exception being some algal species (USEPA 1980, 1985). Although some species (e.g., marine algae and shellfish) tend to bioconcentrate arsenic, it is not biomagnified through the food chain (ATSDR 2007).

4.4 Toxicity

The effects of arsenic on natural resources are influenced by interactions with the surrounding matrix as well as the actual form of arsenic. In general, inorganic arsenic compounds are more toxic than organic compounds, and trivalent arsenic species are more toxic than pentavalent arsenic species. While the mechanisms of arsenic toxicity can vary among different forms, the overall symptoms of chronic arsenic intoxication in birds and mammals are generally similar and include muscular incoordination, debility, slowness and seizures, all of which may also be commonly induced by other toxicants. Acute exposures to arsenic typically produce lethal responses in birds, mammals and aquatic species. In amphibians and reptiles, effects of arsenic include mortality and/or malformations in developing embryos. Most plants show decreases in crop yields when exposed to elevated concentrations of water soluble arsenic or total arsenic in the soil.

The effects of arsenic on natural resources are influenced by a number of factors, including, the form of arsenic, species and/or species group, and organism life stage (Irwin 1997). For example, inorganic arsenic is more toxic than organic arsenic, and trivalent arsenite compounds are more toxic than pentavalent arsenate compounds. Generally, plants are more sensitive to arsenic than animals (Lindsay and Sanders 1990, as cited in Irwin 1997), and early life stages are more sensitive than adult stages. Examples of the toxicity of arsenic to plants, invertebrates, fish, amphibians and reptiles, birds, and mammals are summarized below.

Plants are moderately susceptible to arsenic toxicity (Lindsay and Sanders 1990, as cited in Irwin 1997). The sorption of arsenate ions in the soil by iron, zinc and aluminum greatly restricts the exposure of arsenic to plants (Walsh 1977, as cited in Irwin 1997). In addition, bioavailability is affected by soil pH; texture; and organic matter, phosphorus and calcium content (Woolson 1975, as cited in Irwin 1997). Once absorbed, arsenic is mainly accumulated in the roots. According to the Texas State Soil and Water Conservation Board,[1] arsenic levels in soils higher than 7 parts per million (ppm) affect sensitive plants and concentrations higher than 17 ppm kill newly established vegetation (Irwin 1997). Furthermore, a study by Panaullah et al. (2009) showed a decrease in rice yields of 16 percent at arsenic water concentrations of 0.13 ppm. A review by Eisler (2004) identified adverse effects to terrestrial vegetation at water concentrations ranging from 3 to 28 ppm.

In invertebrates, arsenic intoxication can result in decreased reproduction and/or survival. Adsorption of arsenic to the exoskeleton of invertebrates appears to be an important accumulation mechanism (Mason et al. 2000). Bartell (1970, as cited in Irwin 1997) calculated the effect concentration to 50 percent of organisms (EC_{50}) of *Daphnia magna* at 4.3 ppm in water after 4 days. Biesinger and Christensen (1972,

[1] The Texas State Soil and Water Conservation Board is the state agency that administers Texas' soil and water conservation law and coordinates conservation and nonpoint source pollution abatement programs throughout the State.

as cited in Irwin 1997), exposed *Daphnids* to 0.52 and 1.4 ppm of arsenate in water for 3 weeks, which resulted in a 16 and 50 percent decrease in reproduction, respectively.

In fish, acute arsenic intoxication can cause immediate death, often due to a corresponding increase in mucus leading to suffocation. Chronic exposures result in accumulation of the metalloid to toxic levels, affecting the liver and resulting in morphological alterations. A study by Sorensen (1976) looked at the effects of sodium arsenate on green sunfish, reporting lethality to 50 percent of the population (LC_{50}) at water concentrations of 500 ppm and 100 ppm after 17 and 46 hours of exposure, respectively. Furthermore, a study by Richardson (1992, as cited in Irwin 1997) calculated an EC_{50} for fathead minnow of 141 ppm arsenic in water after 96 hours of exposure.

In amphibians and reptiles, effects of arsenic include mortality and/or malformations in developing embryos. Chen et al. (2009) exposed leopard frogs from post-hatch stage through metamorphosis to water concentrations ranging from 0.01 to 1 ppm for 113 days. At these concentrations, body burdens varied from 0.6 to 5.31 ppm dry mass. The study reported significantly decreased tadpole swimming speeds, but no effects on survival, growth, percent metamorphosis, or sex ratio. In contrast, a study by the USEPA (1985, as cited in Eisler 2004) found LC_{50} values for developing embryos of the narrow-mouthed toad at As(+III) water concentrations of 0.04 ppm after 7 days of exposure.

Arsenic intoxication in birds results in ataxia, reduced growth, muscular incoordination, debility, slowness and seizures (Moore et al. 1990, as cited in Irwin 1997). For example, Albert (2006) looked at the effect of an arsenic-based pesticide on zebra finches. After 14 days, adult zebra finches showed significant less body mass when dosed with 24 and 72 ppm body weight (bw) per day (bw/d) of monomethylarsonic acid [MMA (V)]. Albert et al. (2008) showed a greater effect of MMA (V) on zebra finch nestlings: doses of 36 and 72 ppm bw/d resulted in complete mortality, suggesting that nestlings are more sensitive to arsenic toxicity than adults. Furthermore, a review by Eisler (2004) identified lethal doses to 50 percent of organisms (LD_{50}) at oral doses ranging from 17 to 48 ppm bw.

Arsenic intoxication effects in mammals include muscular incoordination, debility, slowness, and seizures. These are similar to the effects on birds and might be induced by other toxicants. Arsenic is a carcinogen that can traverse placental barriers and result in fetal deaths and malformations in many species of mammals (Eisler 2004). Santra et al. (2000) showed the effects of arsenic exposure on the livers of mice by exposing them to water containing 3.2 ppm of arsenic acid, which resulted in hepatic fibrosis and loss in hepatic function after 1 year. A review of multiple toxicological studies on mammals by Eisler (2004) identified LD_{50s} at oral doses ranging from 2.5 to 33 ppm bw.

5. Barium

5.1 Overview

Barium is a metallic, naturally-occurring element. Barium and barium-containing compounds are utilized in several ways. Fossil fuel industries use barium sulfate in drilling mud. It is also used in the manufacturing of paints, bricks, tiles, glass, and rubber. Barium carbonate, barium chloride, and barium hydroxide are used for a variety of purposes including making ceramics, insect and rat poisons, additives for oils and fuels, as a boiler water treatment, as well as in sugar refining (ATSDR 2007).

Barium is present in small quantities in igneous rocks such as feldspar and micas and may also be found as a natural component of fossil fuel. Barium is emitted into the atmosphere mainly by the industrial processes involved in the mining, refining, and production of barium and barium-based chemicals and as a result of combustion of coal and oil. Barium sulfate and barium carbonate are the most common barium compounds found in nature, but are not readily water soluble (ATSDR 2007). Some barium containing compounds including barium acetate, barium chloride, barium hydroxide, barium nitrate, and barium sulfide dissolve more rapidly in water but are less commonly encountered in nature than barium sulfate and barium carbonate (ATSDR 2007).

5.2 Environmental Fate and Transport

Although barium exists in two oxidation states (0 and +II), it is found in only the +II oxidation state in natural waters. It is highly reactive and therefore does not exist as a metal in the environment, but rather only in a combined state with other elements. Most barium released to the environment from industrial sources is in forms that do not become widely dispersed (Ng and Patterson 1982). In the atmosphere, barium is likely to be present in particulate form (USEPA 1984). Conditions such as pH, Eh (oxidation reduction potential), cation exchange capacity, and the presence of sulfate, carbonate, and metal oxides (e.g., oxides of aluminum, manganese, silicon, and titanium) affect the partitioning of barium and its compounds in the environment. Although chemical reactions may cause changes in speciation of barium in air, the main mechanisms for the removal of barium compounds from the atmosphere are likely to be wet and dry deposition (USEPA 1984).

In aquatic media, barium is likely to precipitate out of solution as an insoluble salt (i.e., as $BaSO_4$ or $BaCO_3$). Waterborne barium may also adsorb to suspended particulate matter through the formation of ion pairs with bicarbonate or sulfate (Bodek et al. 1988; USEPA 1984; Giusti et al. 1993; Lagas et al. 1984; Tanizaki et al. 1992). Precipitation of barium sulfate salts is accelerated when rivers enter the ocean because of the high sulfate content [2,700 milligrams per liter (mg/L)] in the ocean (Bowen 1966; WHO 2001). It is estimated that only 0.006 percent of the total barium input into oceans from freshwater sources remains in solution (Chow et al. 1978; WHO 2001). Sedimentation of suspended solids removes a large portion of the barium content

from surface waters (ATSDR 2007). Precipitation of barium from fresh and marine waters might also occur, in part, as the result of the barite ($BaSO_4$) crystal formation in microorganisms (González-Muñoz et al. 2003). Barium in sediments is found largely in the form of barite. Coarse silt sediment in a turbulent environment will often grind and cleave the barium sulfate from the sediment particles leaving a buildup of dense barites (Merefield 1987).

5.3 Uptake and Bioaccumulation

Barium bioconcentrates in some plants and aquatic organisms (Aruguete et al. 1998; Bowen 1966; Hope et al. 1996; IPCS 1991; Schroeder 1970; WHO 2001). However, the extent to which plants bioconcentrate barium from soil or to which uptake occurs in terrestrial animals is not well characterized. In humans and other mammalian species that have been evaluated, barium is absorbed from dietary exposures and accumulated primarily in the bone (ATSDR 2007). The absorption of barium from the gastrointestinal tract is compound dependent. Barium sulfate is extremely insoluble and very little, if any, ingested barium sulfate is absorbed. Acid-soluble barium compounds, such as barium chloride and barium carbonate, may be absorbed through the gastrointestinal tract, although the amount of barium absorbed is highly variable. Further studies on the bioconcentration of barium by plants and terrestrial animals and on the biomagnification of barium in terrestrial and aquatic food chains would be useful to better characterize the environmental fate of barium and define the importance of food chain accumulation as a source of human exposure.

5.4 Toxicity

Information on the toxicity of barium is limited, however, it has been shown that the effects of barium on natural resources are influenced by interactions with the surrounding matrix including pH and cation exchange. Barium in water has been associated with reduced growth in the green alga (*Pseudokirchneriella subcapitata*) and decreased reproduction and immobility have been reported in *Daphnia magna*). No data regarding the toxicity of barium to amphibians and reptiles were found.

6. Beryllium

6.1 Overview

Beryllium is a naturally-occurring element and the lightest metal. It is present in a variety of materials, such as rocks, coal and oil, soil, and volcanic dust. Bertrandite and beryl are two beryllium-containing mineral rocks which are commercially mined for beryllium. Gem-quality beryl is better known as either aquamarine or emerald. Most of the beryllium ore that is mined is converted into alloys (mixtures of metals). Most of these alloys are used in making electrical and electronic parts or as construction materials for machinery and molds for plastics. Beryllium alloys are also used in automobiles, computers, sports equipment (such as golf clubs and bicycle frames), and dental bridges. Pure beryllium metal is used in nuclear weapons and reactors, aircraft and space vehicle structures, instruments, x-ray machines, and mirrors. Beryllium oxide is also made from beryllium ores and is used to make specialty ceramics for electrical and high-technology applications (ATSDR 2002).

Beryllium enters the air, water, and soil as a result of natural and human activities. Emissions from burning coal and oil increase beryllium concentrations in the air. Beryllium enters waterways naturally from the weathering of rocks and soil. Most beryllium products of human origin that enter waterways come from industry discharges of wastewater and from beryllium dust in the air from industrial activities settling over water (ATSDR 2002). Beryllium, as a chemical component, occurs naturally in soil; however, disposal of coal ash, incinerator ash, and industrial wastes may increase the amount of beryllium in soil.

6.2 Environmental Fate and Transport

In air, beryllium compounds are present mostly as fine dust particles. The dust eventually settles over land and water, with rain and snow helping to remove it from the air. Residence time in air is typically very short; extremely small beryllium particles may remain in the air for about 10 days.

Although beryllium exists in three oxidation states (0, +I, and +II), it exists only in the +II oxidation state in natural waters. Some beryllium compounds are soluble in water and some are not (ATSDR 2002). However, in the environment, chemical reactions can change the water-soluble beryllium compounds into insoluble forms. In some cases, water-insoluble beryllium compounds can change to soluble forms. The reaction of beryllium in water is controlled by chemical speciation, which in turn is very dependent on pH. In the pH range typical of most natural waters (i.e., 6 to 8), the speciation of beryllium is controlled by the formation of solid beryllium hydroxide, $Be(OH)^2$, which has a very low solubility (solubility product, $K_{sp}=10^{-21}$). As a result, most of the beryllium in aquatic systems settles out of the water column and into the sediment.

6.3 Uptake and Bioaccumulation

Beryllium does not appear to significantly bioconcentrate in aquatic organisms (ATSDR 2002). Comparisons of the beryllium concentrations in bottom-feeding biota and surface sediments from Lake Pontchartrain, Louisiana, indicate similar, but somewhat lower, beryllium concentrations in biota (Byrne and DeLeon 1986). There is no evidence of significant biomagnification of beryllium within terrestrial or aquatic food chains, however the data are very limited (ATSDR 2002).

6.4 Toxicity

The effects of beryllium on natural resources are influenced by interactions with the surrounding matrix. Toxicity data for beryllium exposure is limited. Data that are available suggest that the acute oral toxicity of beryllium is low. Avian studies on oral toxicity have not been found.

7. Boron

7.1 Overview

Boron is a common non-metallic element of the earth's crust. It exists primarily as oxyanions called borates. Boron is a dark brown element that is widespread in the environment, but typically found in combined form. Its most common form, borax ($Na_2B_4O_7$), has been used for more than 4,000 years as a cleaning agent (Eisler 1990), and more recently, as a food preservative, though its use for this purpose has been discontinued (Weir and Fisher 1972). The United States supplies roughly 70 percent of the global boron demand, of which, 45 percent is used in glassware manufacturing, 15 percent in laundry products, 10 percent in glazes and enamels, and less than 10 percent for agricultural purposes (Eisler 1990).

Boron can be released from municipal sewage wastewater, coal-burning power plants, copper smelters, and boron-using industries (ATSDR 2010). Of the total boron in coal, up to 71 percent may be lost upon combustion. Over 50 percent of the boron found in coal ash is readily water soluble and can potentially leach into the surrounding water (Pagenkopf and Connolly 1982). Coating coal fly ash with an aluminum solution can significantly reduce boron's solubility, due to the formation of an insoluble aluminum-borate complex (Pagenkopf and Connolly 1982).

7.2 Environmental Fate and Transport

Boron is released to the environment slowly in low concentrations by weathering processes. Although few data are available quantifying boron releases from industrial sources, it is estimated that natural weathering releases are more significant (ATSDR 2010). Borates are relatively soluble in water, and can be removed from the atmosphere by precipitation and dry deposition (USEPA 1987). Boron readily hydrolyzes in water to form boric acid or the monovalent ion $B(OH)_4^-$ (ATSDR 2010). Rai et al. (1986) stated that because most environmentally relevant boron materials are highly soluble in water, it is not likely that mineral equilibrium will control boron's fate in water.

Although boron exists in four oxidation states (0, +I, +II, and +III), it normally exists only in the +III oxidation state in natural waters. Waterborne boron may be adsorbed by soils and sediment. Adsorption-desorption reactions are expected to be the only significant mechanism that will influence the fate of boron in water (Rai et al. 1986). Boron adsorption to soil depends on pH and on the chemical composition of the soil. Greatest adsorption of boron to soil generally occurs at pH 7.5-9.0 (Keren and Mezuman 1981) and in the presence of an abundance of amorphous aluminum oxide (Bingham et al. 1971). Organic matter in the soil, as well as concentrations of iron oxide, are less influential in boron adsorption than the other factors mentioned above (Sakata 1987, Parks and White 1952). In some soils, boron adsorption may be essentially irreversible, presumably due to the solid-phase formation on mineral surfaces (Rai et al. 1986) or the slow release of boron by diffusion in the interior of clay minerals (Griffin and Burau 1974).

7.3 Uptake and Bioaccumulation

It is unlikely that boron is bioconcentrated significantly by aquatic organisms. The uptake of boron by plants is dependent on pH (Sprague 1972).

7.4 Toxicity

The effects of boron on natural resources are influenced by interactions with the surrounding matrix. Boron is an essential trace element for higher plants. Its exact mode of action is unknown, though it appears to have multiple functions (Eisler 1990). Boron poisoning in plants is often characterized by stunted growth, leaf malformation, browning and yellowing, as well as other symptoms, however, sensitivity of aquatic plants is very species specific. Birds exposed to boron as ducklings and adults at varying concentrations exhibit decreased weight gain compared to controls, as well as decreased hatch success. Boron has relatively low toxicity to mammals.

8. Cadmium

8.1 Overview

Cadmium is a widely distributed metal that occurs naturally but at relatively low concentrations in the earth's crust, usually in sulfide minerals that are associated with ores bearing zinc, lead, or copper. Accordingly, most cadmium is produced with zinc, with the rest of production associated with lead, copper, or recycling from cadmium-containing products (ATSDR 2008). Cadmium is used primarily in batteries but is also used for other industrial purposes such as metal coatings and plastic, ceramic, and glass pigments (ATSDR 2008). Cadmium salts such as cadmium chloride have been used as lawn fungicides and in photography, dyeing, and other commercial applications (ATSDR 2008).

Cadmium is released to the environment from both natural and anthropogenic sources, however, anthropogenic releases to air are greater than natural. Natural releases of cadmium to the atmosphere may result from dust, volcanic emissions, forest fires, and ocean spray (ATSDR 2008), while natural releases to soil and water can occur via mineral weathering. Anthropogenic releases to the atmosphere result from industrial and urban emitters such as zinc, lead, copper, and cadmium smelters; coal and oil boilers; phosphate fertilizer manufacturers; incinerators; and road dust (ATSDR 2008). Most anthropogenic releases to water result from nonferrous ore smelting, but can also originate from other industrial or municipal wastewater discharge, leaching and runoff, phosphate fertilizers, and atmospheric deposition (ATSDR 2008). Anthropogenic releases to soil include direct application of fertilizers, gypsums, sewage sludge, compost, and combustion ash; contamination from industrial sites, mine waste, and metal corrosion; and atmospheric deposition (ATSDR 2008).

8.2 Environmental Fate and Transport

Although cadmium exists in three oxidation states (0, +I, and +II), it normally occurs only in the +II oxidation state in the aquatic environment. As for many inorganics, the solubility of cadmium compounds ranges from soluble (e.g., cadmium chloride) to insoluble (e.g., cadmium sulfide, cadmium carbonate, cadmium oxide, except through interaction with acids, light, and oxygen) in water. Higher pH and increased particulate organic matter concentrations result in greater sorption of cadmium to sediments, with associated decreases in water concentrations (ATSDR 2008). Free cadmium is more prevalent at low salinities and appears to be most toxic (ATSDR 2008).

In unpolluted water, most cadmium is expected to be dissolved as $Cd(H_2O)_6^{+2}$ (or as chloride species in saltwater), with some transported in colloids and particulates (ATSDR 2008). Cadmium can be removed from solution through replacement of calcium with cadmium in carbonate minerals. In water containing higher concentrations of organic matter or pollutants, cadmium will tend to undergo adsorption and complexing with agents such as humic acids, followed by carbonate, hydroxide, chloride, and sulfate ions

(ATSDR 2008). Cadmium in water is not strongly influenced by oxidizing or reducing conditions, although cadmium can precipitate as cadmium sulfide under reducing conditions (ATSDR 2008).

Cadmium remobilization from sediments depends on pH, salinity, Eh, and mode of sorption: cadmium adsorbed to clay or organic materials is more likely to dissolve, be bioaccumulated, or otherwise remobilize after disturbance than is cadmium associated with carbonate minerals (ATSDR 2008).

In soil, cadmium is not very mobile but can be more mobile at low pH, in conditions involving competitive cationic sorption, and in upland soil relative to wetland soils (ATSDR 2008). Cadmium is less mobile as a sulfide at elevated pH, when, for example, exchange reactions on the surfaces of clay minerals can become essentially irreversible; and especially in complexes with organic matter (ATSDR 2008).

8.3 Uptake and Bioaccumulation

Uptake of cadmium into terrestrial plants from soil is increased at low pH (ATSDR 2008) and in sandy and noncalcareous soils relative to clay or calcareous soils (ATSDR 2008). Cadmium accumulation has been found in plant leaves (ATSDR 2008) and plant roots (IPCS 1992). In aquatic plants, cadmium was taken up by all plant parts at similar concentrations including roots, stems, and leaves and translocated between leaves and stems (Fritioff and Greger 2005). Cadmium has been found to accumulate in the gills of crayfish (ATSDR 2008) and other aquatic organisms. The liver, kidneys, hepatopancreas, and exoskeleton are other sinks for cadmium in some invertebrates (IPCS 1992). In vertebrates, cadmium is not well absorbed through the intestine and accumulates mostly in the liver and kidneys (ATSDR 2008). In general, marine organisms tend to accumulate more cadmium than freshwater or terrestrial organisms, and older organisms tend to have higher body burdens than younger organisms, but concentrations depend on species, season, background levels, sex, and proximity to anthropogenic sources (ATSDR 2008).

Cadmium uptake from water can be reduced by hardness and the formation of inorganic chloride or organic complexes (IPCS 1992). The influence of hardness on cadmium uptake in organisms with gills may be related to shared uptake mechanisms between cadmium and calcium (IPCS 1992). Other factors such as pH and the presence of food, sediment, zinc, manganese, or iron may also affect uptake in aquatic organisms (IPCS 1992).

A study in toads suggested that females did not accumulate significantly higher body burdens of cadmium at a coal-ash contaminated site compared to a reference site and did not transfer much, if any, cadmium to eggs (Hopkins et al. 2006). However, in two species of anuran frog, body burdens of cadmium tended to be higher in specimens collected from contaminated areas, and larvae tended to contain higher body burdens of cadmium than metamorphs or adults (Roe et al. 2005). Snakes fed fish containing cadmium accumulated cadmium in the gonads, kidney, and liver. Cadmium accumulations in these snakes were significantly higher in the kidney than in control snakes (Hopkins et al. 2001). Juvenile snakes fed these fish over a longer

period accumulated more cadmium, particularly in the liver; accumulations were highest in the liver, with lower accumulation in the kidneys and no significant accumulation in the gonads; however, there were age- and sex-specific differences, with accumulation higher in the gonads in juveniles than in adults and higher in kidneys in females than males (Hopkins et al. 2002).

Both terrestrial and aquatic organisms bioaccumulate cadmium at all levels in food chains (ATSDR 2008). However, data regarding biomagnifications of cadmium through food chains are inconclusive. Cadmium biomagnification was not found in marine pelagic or benthic food webs (ATSDR 2008), but some data show increased concentrations of cadmium in animals at high trophic levels.

8.4 Toxicity

Aquatic invertebrates are sensitive to cadmium, with early life stages typically more sensitive than adults. Hardness, salinity, and the presence of inorganic or organic materials that can complex with cadmium tend to reduce toxicity, while increasing temperature and potentially zinc can increase toxicity. Effects of toxic exposure in fish can include alterations to respiration, alterations to molting, potentially reversible gill damage, and changes to reproductive and developmental success and behavior. Some organisms show signs of being able to develop tolerance to cadmium exposure. For example, cadmium can be bound to proteins (e.g., metallothioneins) as a protective mechanism in animals, which has been observed in fish and mammals in organs such as the gill (fish only), liver, and kidneys.

Few toxicity data were identified for reptile species. However, the existing literature on cadmium exposure to amphibians, particularly tadpoles, is fairly extensive in comparison to other substances and is not comprehensively reviewed here. Effects of cadmium on early amphibian developmental stages may include alterations in gastrulation and neurulation, decreased or delayed limb regeneration, delayed development, mortality, and malformations. Organogenesis stages may be particularly sensitive. While the presence of zinc may increase toxicity, pre-treatment of organisms with cadmium or the presence of other inorganic ions such as magnesium may result in desensitization to cadmium toxicity thereby resulting in a protective effect.

Effects observed in short-term studies in young birds have included increases in kidney, gizzard, and gastrointestinal tract weights; reduced food consumption; reduced weight gain; mortality; hematological changes; and kidney lesions.

In mammals, ingested cadmium tends to target the kidney and bone, although developmental, reproductive, hepatic, hematological, and immunological effects are also possible. Most experimental studies have used soluble cadmium, for which absorption is similar to cadmium complexed with proteins in food.

9. Chromium

9.1 Overview

Chromium is a naturally-occurring element present in the earth's crust. Chromium metal is also commercially produced by the reduction of chromite ore with carbon, aluminum, or silicon, and subsequent purification. Sodium chromate and dichromate are produced by roasting chromite ore with soda ash. Most other chromium compounds are produced from sodium chromate and dichromate (ATSDR 2008). The metallurgical, refractory, and chemical industries are the fundamental users of chromium. In the metallurgical industry, chromium is used to produce stainless steels, alloy cast irons, nonferrous alloys, and other miscellaneous materials. The stainless steel industry is the leading consumer of chromium materials with ferrochromiums as the main components used by the metallurgical industry. In the refractory industry, chromium is a component in chrome and chrome-magnesite, magnesite-chrome bricks, and granular chrome-bearing and granular chromite, which are used as linings for high temperature industrial furnaces. In the chemical industry, both chromium(+III) and chromium(+VI) are used primarily in pigments. Other uses include chromium(+VI) in metal finishing, chromium(+III) in leather tanning, and chromium(+VI) in wood preservatives. Chromium picolinate, a trivalent form of chromium complexed with picolinic acid, is also used as a dietary supplement (ATSDR 2008).

Chromium is released to the environment from natural and anthropogenic sources, with the largest release occurring from industrial releases. The industries with the largest contribution to chromium release include metal processing, tannery facilities, chromate production, stainless steel welding, and ferrochrome and chrome pigment production. Other uses include wood preservation, leather tanning, pigments, and refractories (Barnhardt 1997). On a worldwide basis, the major source to aquatic systems is domestic wastewater effluents, followed by metal manufacturing, ocean dumping of sewage, chemical manufacturing, smelting and refining of nonferrous metals, and atmospheric fallout (ATSDR 2008). In soils, significant releases include disposal of commercial products containing chromium, disposal of coal fly ash and bottom fly ash from electric utilities and other industries, agricultural and food wastes, animal wastes, and atmospheric fallout (ATSDR 2008).

9.2 Environmental Fate and Transport

Chromium has nine oxidation states: -II, -I, 0, +I, +II, +III, +IV, +V, and +VI. In the natural environment, chromium usually occurs as one of two oxidation states: trivalent (+III) chromium and hexavalent (+VI) chromium, depending on the Eh and the pH of the soil. In most soils, chromium will be present predominantly in the trivalent oxidation state. This form has very low solubility and low reactivity, resulting in low mobility in the environment (Barnhart 1997; Jardine et al. 1999; Robson 2003). Under oxidizing conditions, hexavalent chromium may be present in soil as CrO_4^{-2} and $HCrO_4^{-1}$ (James et al. 1997). In this form, chromium is relatively soluble and mobile. A leachability study comparing the mobility of several metals, including

chromium, in soil demonstrated that chromium had the least mobility of all of the metals studied (Sahuquillo et al. 2003). These results support previous data finding that chromium is not very mobile in soil, especially in the trivalent oxidation state (Balasoiu et al. 2001; Jardine et al. 1999; Lin et al. 1996; Robson 2003).

The reduction of hexavalent chromium to trivalent chromium and the oxidation of trivalent chromium to hexavalent chromium in water has been investigated extensively. Reduction of hexavalent chromium to trivalent chromium can occur under suitable conditions in the aqueous environment, if an appropriate reducing agent is available. The most significant reducing agents present in aqueous systems include (in order of decreasing reduction ability) organic matter, hydrogen sulfide, sulfur, iron sulfide, ammonium, and nitrate (Kimbrough et al. 1999). The reduction of hexavalent chromium by S^{-2}or Fe^{+2} ions under anaerobic conditions occurs rapidly, with the reduction half-life ranging from instantaneous to a few days (Seigneur and Constantinous 1995). However, the reduction of hexavalent chromium by organic sediments and soils was much slower and depended on the type and amount of organic material and on the redox condition of the water. The reduction half-life of hexavalent chromium in water with soil and sediment ranged from 4 to 140 days, with the reaction typically occurring faster under anaerobic rather than aerobic conditions (Saleh et al. 1989). Generally, the reduction of hexavalent chromium to trivalent chromium is also favored under acidic conditions (Kimbrough et al. 1999).

9.3 Uptake and Bioaccumulation

The bioavailability of trivalent chromium to a freshwater invertebrate (*Daphnia pulex*) decreased with the addition of humic acid (Ramelow et al. 1989). This decrease in bioavailability was attributed to lower availability of the free form of the metal due to its complexation with humic acid. Based on this information, chromium is not expected to biomagnify in the aquatic food chain. Although higher concentrations of chromium have been reported in plants growing in high chromium-containing soils (e.g., soil near ore deposits or chromium-emitting industries and soil fertilized by sewage sludge) compared with plants growing in normal soils, most of the increased uptake in plants is retained in roots, and only a small fraction is translocated in the aboveground part of edible plants (Cary 1982; WHO 1988). Therefore, bioaccumulation of chromium from soil to aboveground parts of plants is unlikely. There is no indication of biomagnification of chromium along the terrestrial food chain.

9.4 Toxicity

Trivalent chromium is thought to be an essential nutrient required for normal energy metabolism. The effects of chromium on natural resources are influenced by interactions with the surrounding matrix as well as the valence state. Cr^{+6} has been shown to be the more toxic valence state of chromium to benthic and aquatic invertebrates. A large range of toxicity values been reported for fish, depending upon fish size and water pH, with larger fish and higher pH values having higher LC_{50} values. Most toxicity data evaluated for birds has

focused on domestic chickens (*Gallus domesticus*), however, a few studies evaluated exposures to turkeys (*Meleagris gallopavo*) and black duck (*Anas rubripes*).

The effects of chromium on natural resources are influenced by a number of factors including, but not limited to, species and/or species group, organism life stage and the valence state of chromium. For example, sensitivity to chromium varies widely, even among closely related biota (Eisler 1986). In addition, hexavalent chromium (Cr^{+6}) has been shown to be more toxic than trivalent chromium (Cr^{+3}). Hexavalent chromium damages cells via its role as a strong oxidizing agent, whereas Cr^{+3} affects various enzyme processes and reacts with organic molecules (Moore et al. 1990, as cited in Irwin 1997). More detailed information on the toxicity of chromium to plants, invertebrates, fish, amphibians and reptiles, birds, and mammals are summarized below.

Chromium toxicity to plants is affected by many variables, such as soil pH, cation exchange capacity, organic content, and clay content, among other factors (Will and Suter 1994, as cited in Irwin 1997). The greatest toxicity risk is associated with acidic, sandy soils with low organic content. Studies report a wide array of effects of Cr^{+6} exposure to plants including, but not limited to, photosynthesis disruption, germination disruption, reduced growth, reduced yield, decreased mineral nutrition and metabolic alterations (Shanker et al. 2005). A study by Kabata-Pendias and Pendias (1992, as cited in Irwin 1997), considered levels of chromium higher than 100 ppm dry weight (dw) as phytotoxic to terrestrial plants. Aquatic plants are among the most sensitive groups of organisms that have been tested (Eisler 2000). A study by Mangi et al. (1978, as cited in Driver 1994) showed that common duckweed is the most sensitive aquatic plant, exhibiting reduced growth at Cr^{+6} concentrations of 0.01 mg/L In addition, the authors identified a lethal concentration to 50 percent of organisms (macrophytes) (LC_{50}) between 3 and 28 mg/L of Cr^{+6}.

In invertebrates, toxicity of chromium is affected by temperature and salinity. For example, high temperature and low salinity result in the greatest possible toxicity (McLusky and Bryant 1985, as cited in Irwin 1997). Hexavalent chromium exposure has been associated with reduced survival and fecundity (USEPA 1980, as cited in Eisler 2000). Specifically, for *Dapnia magna* at Cr^{+6} concentrations of 0.01 mg/L and Cr^{+3} concentrations of 0.044 mg/L, one USEPA study (1980, as cited in Driver 1994) showed reduced fecundity after 32 days of exposure. For rotifers, the effects concentration to 50 percent of organisms (EC_{50}) for Cr^{+6} was 3.1 mg/L after 4 days of exposure (Buikema et al. 1974, as cited in Irwin 1997). Finally, Murti et al. (1983, as cited in Irwin 1997), determined the EC_{50} for freshwater prawn to be at a Cr^{+6} concentration of 1.84 mg/L after 4 days of exposure.

Chromium toxicity in fish is dependent on the species type, fish size, and water pH; larger fish and higher pH result in a higher LC_{50} (Irwin 1997). Broderius and Smith (1979, as cited in Irwin 1997) determined the LC_{50} for juvenile fathead minnows to be at a Cr^{+6} concentration of 4.36 mg/L after 30 days of exposure. In

addition, Pickering and Henderson (1966, as cited in Driver 1994), identified a LC_{50} for fathead minnow to be 17.6 mg/L after 4 days of exposure.

There is little information on the effects of chromium on reptiles and amphibians. Only one study was identified: Bosisio et al. (2009) reported that Cr^{+6} is toxic to embryos of Africa clawed frogs *(Xenopus laevis).*[2] This study found an LC_{50} at concentrations of Cr^{+6} of 46 mg/l, and significant growth retardation at Cr^{+6} concentrations of 1.3 mg/L.

Few studies are available on the effects of chromium exposure on birds. Adult black ducks exposed to diets containing 10 to 50 ppm Cr^{+3} for 5 months had no effects on survival and reproduction (Heinz and Haseltine 1981, as cited in Eisler 1986). However, a study by Steven et al. (1976, as cited in Driver 1994), showed 100 ppm of dietary Cr^{+6} to be a lethal exposure for black ducks after 3 months of exposure. The same concentration had no effects on chickens, suggesting that they are more resistant to the adverse effects of chromium.

In mammalian species, chromium is considered one of the least toxic trace elements, as stomach pH converts Cr^{+6} to Cr^{+3} (Moore et al. 1990, as cited in Irwin 1997). Mammals can tolerate between one to two hundred times the normal body load without exhibiting negative effects (Moore et al. 1990, as cited in Irwin 1997). Dietary exposure of mice to 20 ppm of chromium oxide for three generations did not cause adverse effects on the animals (Mertz 1975, as cited in Driver 1994). According to Steven (1976, as cited in Eisler 2000), the toxic threshold for rats occurs at 1,000 ppm of dietary Cr^{+6}. The minimum injected fatal dose of Cr^{+6} for most experimental mammalian animals (rabbits, mice, cats, and dogs) ranges from 1 to 5 ppm bw. Lower injected doses of Cr^{+6} of 0.2 to 0.5 ppm bw produced decreased growth and kidney damage (Steven 1976, as cited in Eisler 2000).

[2] This amphibian species is not local to the assessment area. However, very little information on chromium toxicity on reptiles and amphibians is available and therefore we include it for reference purposes.

10. Cobalt

10.1 Overview

Cobalt is a naturally-occurring element with properties similar to those of iron and nickel. Elemental cobalt is a hard, silvery grey metal. Cobalt metal is usually mixed with other metals to form alloys, which are harder or more resistant to wear and corrosion. These alloys are used in a number of military and industrial applications such as aircraft engines, magnets, and grinding and cutting tools. They are also used in artificial hip and knee joints. Cobalt compounds are used as colorants in glass, ceramics, and paints, as catalysts, and as paint driers. Cobalt colorants have a characteristic blue color; however, not all cobalt compounds are blue. Cobalt compounds are also used as trace element additives in agriculture and medicine (ATSDR 2004).

Small amounts of cobalt are naturally found in most rocks, soil, water, plants, and animals. In the environment, cobalt is usually found combined with other elements such as oxygen, sulfur, and arsenic. Cobalt may enter the environment from both natural sources and human activities. It may enter air and water from windblown dust, seawater spray, volcanic eruptions, and forest fires. It settles on land and may additionally get into surface water from runoff and leaching when rainwater washes through soil and rock containing cobalt. Soils near ore deposits, phosphate rocks, or ore smelting facilities, and soils contaminated by airport traffic, highway traffic, or other industrial pollution may contain high concentrations of cobalt. Small amounts of cobalt may be released into the atmosphere from coal-fired power plants and incinerators, vehicular exhaust, industrial activities relating to the mining and processing of cobalt-containing ores, and the production and use of cobalt alloys and chemicals. ^{58}Co and ^{60}Co may be released to the environment as a result of nuclear accidents, radioactive waste dumping in the sea or from radioactive waste landfills, and nuclear power plant operations (ATSDR 2004).

10.2 Environmental Fate and Transport

There is only one stable isotope of cobalt, but multiple unstable or radioactive isotopes exist. All isotopes of cobalt behave the same chemically and will therefore have the same chemical behavior in the environment. Cobalt released from power plants or other combustion processes is usually attached to fine particulates. Cobalt contained in windborne soil is generally found in larger particles than those released from power plants. These large particles settle to the ground or are washed out of the air by rain. Cobalt that is attached to very small particles may stay in the air for many days. Cobalt released into water may stick to particles in the water column or to the sediment at the bottom of the body of water into which it was released, or remain in the water column in ionic form (ATSDR 2004).

Cobalt exists in seven oxidation states: -I, 0, +I, +II, +III, +IV, and +V. In water, cobalt exists only in the +II and +III oxidation states, and Co(+II) is the most common form. The specific fate of cobalt will depend on

many factors such as the chemistry of the water and sediment at a site as well as the cobalt concentration and water flow. Ultimately, most cobalt ends up in the soil or sediment (ATSDR 2004). Cobalt deposited on soil or sediment is often strongly attached to particles and therefore is not very mobile. However, the amount of cobalt that is mobile will increase under more acidic conditions.

10.3 Uptake and Bioaccumulation

Cobalt is an essential element. Plants can accumulate very small amounts of cobalt from the soil, especially in the parts of the plant that are eaten most often, such as the fruit, grain, and seeds. However, cobalt is not known to biomagnify up the food chain. In a study of the concentrations and distribution of 14 elements in oceanic seabirds, the concentration of cobalt appeared to be highly regulated, with over 80 percent of the body burden residing in the skeleton (ATSDR 2004). Similarly, in a broad survey of contaminant levels in nine species of fish and fiddler crabs from 11 sites in the lower Savannah River, Georgia and the Savannah National Wildlife Refuge, mean cobalt concentrations among different species and sites were statistically indistinguishable (ATSDR 2004). These and other studies indicate that cobalt does not biomagnify up the food chain (ATSDR 2004).

10.4 Toxicity

Cobalt is an essential trace metal that functions as a component of vitamin B12. Non-ruminant animals require dietary intake of cobalt in the physiologically active form of vitamin B12. Although cobalt is an essential nutrient, excessive oral doses result in a variety of adverse responses. The best characterized toxic responses are increases in red blood cell counts (polycythemia), cardiomyopathy, and effects on the male reproductive system. In addition, reduced food and water intake and growth inhibition are commonly observed. At present, the mechanisms underlying cobalt toxicity are poorly understood.

11. Copper

11.1 Overview

Copper occurs naturally in the earth's crust as an elemental metal and in many minerals (ATSDR 2004). Copper can be mined, especially from sulfide ores, or recovered from scrap and is usually used as copper metal, copper alloys such as brass and bronze, or copper sulfate. Copper is used in construction; electrical equipment; transportation equipment; industrial equipment; various consumer products; coinage; agriculture as fungicides, algicides, insecticides and repellents, and nutritional supplements; metal finishing; mineral flotation; wood preservatives; electroplating; dying; petroleum refining; and water treatment (ATSDR 2004).

Copper is released to the environment from both natural and anthropogenic sources, although anthropogenic releases are probably greater (ATSDR 2004). Natural releases of copper to the atmosphere may result from volcanoes, windblown dust, ocean spray, forest fires, and biogenic processes (ATSDR 2004), while natural releases to water result primarily from natural weathering and atmospheric deposition. Anthropogenic releases of copper are primarily to land, followed by air, underground injection, and water (ATSDR 2004). Releases of copper to air may result from metals production and processing, wood production, fossil fuel combustion, phosphate fertilizer production, waste incineration, and other industrial applications (ATSDR 2004). Releases of copper to water result primarily from domestic wastewater and runoff; direct industrial discharges, direct addition to water bodies for algal control, and potential leaching from landfills or copper-containing products are comparatively minor (ATSDR 2004). Releases of copper to soil occur via mine and mill tailings, which are usually insoluble sulfides or silicates; sewage sludge; municipal refuse and discarded plumbing, wiring, and other copper products; electroplating waste; iron and steel production; and agricultural products (ATSDR 2004).

11.2 Environmental Fate and Transport

Copper occurs in five oxidation states: 0, +I, +II, +III, and +IV (ATSDR 2004). In natural waters, Cu(+II) [represented by, among other forms, the cupric ion (Cu^{+2})] is the most common oxidation state and forms compounds and complexes that are frequently soluble such as copper chloride, copper nitrate, and copper sulfate; however, copper carbonate, cupric hydroxide, cupric oxide, and cupric sulfide will form colloidal suspensions or precipitate at excess cupric ion levels. Cu(+I) [represented by, among other forms, the cuprous ion (Cu^{+1})] is unstable in water except in insoluble forms such as cuprous sulfide or cuprous chloride and will typically be reduced to Cu(0) or oxidized to Cu(+II), although photochemical reactions in saltwater may form more persistent cuprous complexes. Cu(+III) is not very common or important in the environment (ATSDR 2004; Eisler 1998).

In freshwater, the solubility of copper salts is modified by numerous water chemistry parameters and is decreased under reducing conditions (Eisler 1998). The free hydrated cupric ion is not very common.

Copper reacts with many inorganic and especially dissolved organic materials in water, leading to precipitation (e.g., malachite, cupric hydroxide, azurite; cuprous sulfide, cuprous oxide, and metallic copper in anaerobic waters), adsorption, and complexation. The free cupric ion may dominate at pH less than 6, but copper bicarbonate/carbonate species are expected to dominate between pH 6 and 9.3, unless this relationship is modified by the presence of certain substances such as humic acids (ATSDR 2004; Eisler 1998). Components of the soluble fraction of copper in water vary in lability (e.g., the relative ability of copper to disassociate from the bound form to the free ion), and the reaction and association of copper with inorganic and organic ligands depends on a variety of factors such as pH, oxidation-reduction potential, and presence of competing cations and anions (ATSDR 2004). In saltwater, studies suggest that species such as copper hydroxide, Cu(OH)Cl, copper carbonate, and cupric ion are dominant (Eisler 1998).

Most copper in water is expected to be associated with suspended particulate matter because copper tends to rapidly adsorb to or complex with inorganic and organic materials (ATSDR 2004). Copper binds most frequently to organic matter (humic or fulvic acids) and hydrous iron oxides in sediments; experiments with aerobic estuarine sediments and artificial saltwater, in which affinities were not affected much by salinity, suggested that the binding affinity of copper was highest for hydrous manganese oxide but that this was likely to be less important than other phases due to low concentrations in sediment (ATSDR 2004). In anaerobic sediments, cupric salts are reduced to cuprous salts (ATSDR 2004).

11.3 Uptake and Bioaccumulation

Copper is an essential nutrient for plants, and uptake of copper from soil through roots is actively regulated (ATSDR 2004). Different plant species vary widely in tolerance and ability to accumulate copper (Eisler 1998). Copper bioavailability to plants may be determined by numerous factors, including qualities of the soil and plants themselves, although soil pH has been found to have no consistent effect on uptake or copper concentrations in plant tissues (ATSDR 2004). In aquatic plants, copper concentrations have been found to be highest in roots; copper appears to be retained in the compartment of uptake (e.g., roots, stems, and leaves) without translocation to untreated parts. Copper uptake appeared to be inhibited somewhat by competition with other metals (Fritioff and Greger 2005).

Copper is also an essential nutrient for animals. Copper accumulation in invertebrates, fish, birds, and mammals often varies by season and age, with younger animals showing higher concentrations than older animals (Eisler 1998). Copper uptake, accumulation, and subsequent toxicity can also be modified by interaction with many inorganic and organic substances, including aluminum, cadmium, iron, manganese, molybdenum and sulfur, zinc, lead, magnesium, silver, calcium, dissolved organic carbon, organic chelators, the presence of sediments, salinity, alkalinity, and pH. For example, exposure to both copper and cadmium have been found to increase accumulations in crayfish, barnacles, and birds but decrease accumulations in freshwater clams and mammals (Eisler 1998). Iron, molybdenum and sulfur, and zinc may act antagonistically with copper in mammals (Eisler 1998; USEPA 2007b).

Aquatic animals accumulate copper primarily through the diet; in invertebrates, accumulation primarily occurs in digestive parts (Eisler 1998). High bioconcentration of copper has been observed in mollusks, which may be attributable to the copper-containing respiratory pigment hemocyanin (Eisler 1998) and to filter-feeding and high concentrations of copper in particulate matter. Copper-tolerant crayfish accumulated the chemical in various tissues, with the hepatopancreas and gills showing the highest concentrations (Eisler 1998). There is some varying evidence regarding the relationship between mollusk tissue concentrations and concentrations of copper in water or sediment (Eisler 1998). Little to no biomagnification of copper has been observed in aquatic food chains (ATSDR 2004), although Eisler (1998) reviewed several studies that showed some potential in estuarine and marine food chains.

Vertebrates tend to accumulate copper in the liver (Eisler 1998). In fish, copper bioaccumulation is low (ATSDR 2004). Freshwater fish exposed to copper in water accumulated the chemical in various tissues, with the highest concentrations in the liver (Eisler 1998; IPCS 1998). Similarly, rainbow trout exposed to copper in the diet accumulated copper in various tissues, with the highest concentrations in the liver (IPCS 1998).

A study in toads suggested that females did not accumulate significantly higher body burdens of copper at a coal-ash contaminated site compared to a reference site and did not transfer much, if any, copper to eggs (Hopkins et al. 2006). In two species of anuran frog, body burdens of copper tended to be higher in one species collected from contaminated areas, and larvae and males tended to contain higher body burdens of copper than metamorphs or adults (Roe et al. 2005). Copper was not accumulated significantly in juvenile snakes fed copper-containing fish, although levels were potentially elevated in the liver, especially in females (Hopkins et al. 2002).

Little to no bioaccumulation of copper in terrestrial organisms or biomagnification of copper through terrestrial food webs has been observed, although one study showed higher copper concentrations in secondary and tertiary consumers in a forest compared to soil and primary producers (ATSDR 2004).

Birds tend to retain little ingested copper and may exhibit elevated metallothionein concentrations in the liver at elevated concentrations of copper in the diet (Eisler 1998). Studies in domestic birds have found elevated copper concentrations in the liver after being fed a diet containing copper; however, temporal declines in liver concentrations were often observed after a certain point, and chicks were resistant to liver accumulation and damage compared to ducklings (Eisler 1998). In mammals, copper is stored mainly in the liver, brain, heart, kidney, and muscle, but interspecies differences in accumulation may be considerable (Eisler 1998). In domestic and laboratory mammals fed at a wide range of doses and feed regimes, accumulation in the liver has been observed (Eisler 1998).

11.4 Toxicity

Copper is an essential nutrient for both plants and animals, therefore, organisms can exhibit adverse effects from copper deficiency as well as from excess copper. As a result, toxicity data for copper should generally be interpreted in conjunction with knowledge, where available, of deficient and adequate levels of copper in the organisms in question.

As an essential nutrient in plants, copper is involved in oxidation, photosynthesis, protein and carbohydrate metabolism, nitrogen fixation, valence changes, and cell wall metabolism (USEPA 2007b). Copper deficiency may result in wilting leaves, reduced growth, chlorosis or melanism, white twisted tips, and reduction in the formation of panicles (Eisler 1998; USEPA 2007b).

Free ionic copper is the most toxic form of copper, while carbonate species are much less toxic (Eisler 1998). In aquatic systems, copper toxicity may vary widely due to factors such as temperature, pH, dissolved organic matter, suspended particulate matter, hardness, and alkalinity, all of which may affect speciation and associated bioavailability. In general, copper toxicity is lower at increased water hardness, adequate diet, lower temperatures, later developmental stages, and continuous rather than pulsed exposures. The toxicity of copper is generally greater to lower taxa (IPCS 1998). Copper has been widely used for the control of nuisance or pathogenic algae, macrophytes, snails, protozoan fish parasites, watercraft fouling organisms, livestock parasites, and mildew and other organisms that attack plants, food, and textiles. Sensitivities to copper vary widely within taxa; for example, concentrations of copper that are toxic to cryptophytes may not be toxic to diatoms, and those toxic to filamentous algae and submerged vegetation may not be toxic to emergent vegetation (Eisler 1998). Copper is known to inhibit photosynthesis, nitrogen fixation, phosphorus uptake, and plant growth in aquatic plants, although species may differ in sensitivity. The reproduction of macroalgae, particularly red macroalgae, appears to be generally sensitive to copper (USEPA 2007a).

Copper has been associated with gill damage in aquatic invertebrates, as well as valve closure, reduction in filtration rates, cardiac inhibition, reproductive impairment, and altered feeding rates. In fish, it interferes with osmoregulation and may also affect blood chemistry, gill and skin histopathology, immune system, behavior and movement, olfaction and lateral lines, liver, and kidneys. However, some aquatic species may possess metallothioneins and other metal-binding proteins that sequester copper in the body, acting as a detoxifying mechanism.

Copper toxicity data for amphibians and reptiles are limited. There is some evidence to suggest that tissue concentrations in amphibians may be associated with reproductive and developmental effects, but the correlation has not been confirmed. Studies on aquatic snakes suggest that relatively high exposures are needed to induce significant effects in reptiles, but reproductive endpoints have not been assessed.

In birds and mammal, copper is an essential nutrient that is incorporated into numerous enzymes and structural proteins and involved in hemoglobin formation, carbohydrate metabolism, catecholamine synthesis, and cross-linking in collagen, elastin, and keratin (IPCS 1998; USEPA 2007b). Signs of copper deficiency can include anemia, reductions in growth and survival, cardiovascular and skeletal damage and rupture, hair loss, and effects on the central nervous and immune systems. In general, excess copper alters cellular membrane permeability and interferes with oxygen transport and energy metabolism. Copper has not been demonstrated to be a carcinogen, mutagen, or teratogen. Copper homeostasis is maintained by binding excess copper to metallothioneins in the intestine and liver, but excessive chronic copper exposure can lead to gastrointestinal distress, liver and kidney damage, anemia, immunotoxicity, and developmental toxicity (ATSDR 2004). Soluble copper salts are typically more acutely toxic to mammals than less soluble salts such as cuprous oxide and cupric hydroxide.

12. Iron

12.1 Overview

Iron is a commonly occurring metallic element, comprising 4.6 percent of igneous rocks and 4.4 percent of sedimentary rocks (Morel and Hering 1993). Iron typically occurs in soils at concentrations from 0.2 percent to 55 percent (Bodek et al. 1988). Native iron concentrations are region-specific, and can vary significantly even within localized areas due to soil types and presence of other sources. Sandy soils have the lowest overall iron content, and clay-dominant soils have the highest iron content (McGovern 1987); however, there is significant overlap in these ranges.

Significant amounts of iron are released into the environment as a result of coal mining. During these operations, pyrite (FeS_2), which is found in coal seams, is exposed to air and water. The sulfide is oxidized to sulfate by bacterial and chemical reactions, releasing hydrogen ions and thus acidifying the water. In the process dissolved ferrous iron (Fe^{+2}) is released and reacts with oxygen to form ferric iron (Fe^{+3}), which hydrolyzes to form insoluble ferric hydroxide ($FeOH_3$). The ferric hydroxide precipitates out in mines and streams where it acts as a reservoir for insoluble ferric iron, which can then react with pyrite to generate soluble ferrous iron (Bodek et al. 1988).

12.2 Environmental Fate

Iron exists in nine oxidation states: -II, -I, 0, +I, +II, +III, +IV, +V, and +VI; however, it commonly exists only in the +II and +III oxidation states in natural waters. Fe(+III) [represented by, for example, the ferric ion (Fe^{+3})] dominates in oxic water because it is the more oxidized form; whereas Fe(+II) [represented by, for example, the ferrous ion (Fe^{+2}) dominates in anoxic water because it is the more reduced form. The general rule governing the mobilization and fixation of iron are that oxidizing and alkaline conditions promote the precipitation of insoluble Fe(+III) oxides, whereas acidic and reducing conditions promote the solution of ferrous [Fe(+II)] compounds. The availability of ferrous vs. ferric iron is also dependent on the soil-water status of a particular environment. For example, reduced environments (which include lowland or waterlogged soils) promote the availability of ferrous iron to plants, while oxidized environments (upland or well-aerated soils) promote the precipitation of low-solubility ferric-oxide compounds, which are not available to plants for uptake. If the ferrous iron concentration is relatively high, iron toxicity may occur in plants, but this is highly dependent upon plant species. Likewise, if ferrous iron is not available in soils due to precipitation of ferric iron compounds, iron deficiency or chlorosis may occur. Proper soil management can help control the pH and soil-water status and allow optimal concentrations of bioavailable ferrous iron to plants (USEPA 2003)

12.3 Uptake and Bioaccumulation

Iron is an essential element for plant growth. It is necessary for chlorophyll synthesis and functions in some enzymes of the respiratory system. While it is an extremely abundant element in rocks and soil, it is also commonly deficient for many plants. Iron is absorbed by plants as ferrous iron (Thompson and Troeh 1973). This is due primarily to the highly insoluble nature of ferric (Fe^{+3}) iron. Iron occurs predominantly as Fe^{+3} oxides in soils (Bodek et al. 1988). Goethite (α-FeOOH) is the predominant mineral form (Kabata-Pendias and Pendias 1984). The divalent state (or ferrous state) can be oxidized to the trivalent state (or ferric state), where it may form oxide or hydroxide precipitates, and become unavailable to plants as a micronutrient (Thompson and Troeh 1973). Roots of some plants are able to reduce iron from the ferric to the ferrous state, and allow iron uptake into the plant (Grussak 1996), however, almost all instances of iron deficiency in plants are considered to occur because of soil factors that govern iron solubility (Kabata-Pendias and Pendias 1992).

Some forbs, including legumes, are known to accumulate more iron than are grasses. However, where iron is easily soluble, plants may take up a very large amount of iron. This is clearly shown by vegetation grown in soils derived from serpentine. The nutritional requirements of grazing animals are usually met at iron concentration ranging from 50 to 100 milligrams per kilogram (mg/kg) (dry weight) in forage. Edible parts of vegetables appear to contain fairly similar amounts of iron, with lettuce being in the upper range and onion in the lower range (USEPA 2003).

12.4 Toxicity

The effects of iron on natural resources are influenced by interactions with the surrounding matrix as well as the form of iron. It is an essential nutrient for plants and animals and its uptake is regulated by most species. In oxic, circumneutral pH waters, dissolved iron concentrations are low due to precipitation as insoluble Fe(III) oxyhydroxides. While toxicity due to dissolved iron is rare, this precipate may accumulate on aquatic organisms. If this precipitation occurs on fish or invertebrate gills or eggs, reduced oxygen diffusion may occur leading to suffocation. Burrowing organisms may also come into contact with anoxic conditions, which may have substantially different dissolved iron concentrations than the overlying oxic conditions.

The main concern from an ecological risk perspective for iron is not direct chemical toxicity but rather the effect of iron as a mediator in the geochemistry of other potentially toxic metals. Metal cations including arsenic, selenium, cadmium, copper, nickel, lead, and zinc can adsorb to insoluble iron oxides in aquatic environments. This has an effect of reducing exposure to other metals as dissolved metal, but this can have the effect of increasing exposure as well. Benthic organisms in close contact with the sediment may be exposed to more of the bound metals, and may ingest significant amounts of the iron-bound metals. No data were found regarding the toxicity of iron to birds and mammals.

13. Lead

13.1 Overview

Lead occurs naturally and widely in the earth's crust in readily accessible ore deposits, although elevated concentrations are typically associated with human activities (ATSDR 2007). Lead can be mined, especially from sulfide ores and with zinc, silver, and copper, or recovered from scrap such as recycled lead-acid batteries (ATSDR 2007). Because lead possesses a number of useful properties such as easy manipulation and chemical stability in environmental media, it is used as a pure or alloyed metal and in chemical compounds for many purposes. These purposes include storage batteries; bearings, brass, bronze, solders, weights, and casting metals for commercial and industrial equipment; nuclear and x-ray shielding, cable coverings, and noise control; chemical resistant linings; ammunition; sheets and pipes for construction, storage, and transport; and pigments and compounds used in glass, ceramics, plastic stabilizers, caulk and paints (ATSDR 2007). Formerly widespread uses of lead that are being phased out include lead in water pipes, food cans, ammunition, sinkers, and house paints; tetraethyl lead in gasoline; and lead-arsenic compounds in biocides (ATSDR 2007).

Lead is released to the environment from both natural and anthropogenic sources, although anthropogenic releases are greater. Natural releases of lead may result from volcanic emissions, windblown dust, and erosion. Anthropogenic releases of lead to air, water, and soil include mining and processing of lead and other ores and metals; combustion of lead additive-containing fuels; electrical generation; other industrial manufacturing processes; waste disposal and recycling; runoff; atmospheric deposition; dust or dissolution from lead-containing materials such as paint, ammunition, and sinkers; and acid leaching from pipes (ATSDR 2007).

13.2 Environmental Fate and Transport

Lead occurs in three oxidation states: 0, +II, and +IV. Pb(+II) [represented by the Pb^{+2} ion] is the common oxidation state in natural waters. Metallic lead occurs naturally but is rare. Tetravalent lead is dominant in organolead compounds but is not found in inorganic compounds under normal environmental conditions because of the extremely oxidizing conditions required. Most lead in the environment is divalent lead. Lead compounds with acetate, nitrate, and halogens are more soluble than oxide, sulfate, sulfide, carbonate, and other compounds (ATSDR 2007).

In surface water, concentrations of soluble lead depend on pH and dissolved salt content. In soft water, lead sulfate may limit lead concentrations in solution; above pH 5.4, lead carbonates may limit those concentrations (ATSDR 2007). However, most lead in water is expected to be in insoluble forms: colloidal particles; particles of lead compounds such as carbonates, oxides, hydroxide, and sulfides; or lead compounds incorporated into particulate matter by sorption to substances such as organic matter, clay,

and iron and manganese oxides (ATSDR 2007). Generally, sorption of lead is higher at higher pH, although the amount of lead for binding to organic matter decreases at as water hardness is increased (ATSDR 2007). Due to lead's tendency to be bound to other materials, sediments are sinks for lead via precipitation and sedimentation (Eisler 1988).

Tetraalkyl lead compounds such as tetraethyl lead are not very soluble in water and are eventually removed by volatilization or degraded to inorganic divalent lead oxides by photolysis and biodegradation (ATSDR 2007). Microorganisms in anaerobic lake sediment can create tetramethyl lead by alkylating organic and inorganic lead compounds; however, if aerobic water overlies those sediments, the tetramethyl lead will oxidize and will not volatilize well (ATSDR 2007). Other aquatic biota may also be able to alkylate inorganic lead (Eisler 1988).

In soil, the fate of lead depends on pH, soil type, particle size, soil organic matter content, the presence of inorganic colloids and iron oxides, cation exchange capacity, and the amount of lead in soil (ATSDR 2007). In general, atmospheric deposition is the primary source of lead accumulation because lead is usually strongly retained in surface soil, especially at pH ≥ 5 and at least 5 percent organic matter; any transport to surface water typically occurs through soil erosion (ATSDR 2007). The relative immobility of lead results from precipitation of less soluble forms of lead; entrapment in crystalline matrices or in water in soil macro- and micro-pores; and cation exchange, adsorption, and complexation with clay, silt, iron and manganese oxides, and especially organic matter (ATSDR 2007). However, at low pH, if concentrations exceed cation exchange capacity, or in the presence of materials that can form soluble chelates with lead, lead may become mobile and leach or run off (ATSDR 2007). Thus, at pH 6-8 and high organic carbon, insoluble organic lead complexes are dominant in soil; with less organic carbon, hydrous lead oxide complexes or carbonate and phosphate precipitates may form; and at pH 4-6, soluble organic lead complexes may become mobile and available for uptake (ATSDR 2007). Tetraalkyl lead compounds are metabolized by soil microbes to more water-soluble compounds that may also be more mobile or more persistent than the original compounds (ATSDR 2007).

13.3 Uptake and Bioaccumulation

The bioavailability of lead to terrestrial plants in soil is typically limited but increases at low pH and low organic matter content. Plants can take up lead from soil via roots, via leaves and translocation, or via atmospheric deposition of particulates (ATSDR 2007). Generally, root uptake is minimal, although concentrations in roots tend to be higher than in stems or leaves, and aerially deposited lead is the most important source in plants but difficult to remove (ATSDR 2007). Animals may take up lead in the diet, and older organisms or older parts of organisms tend to contain greater body burdens of lead (ATSDR 2007; Eisler 1988). Birds administered lead through a variety of oral regimes have accumulated residues, not including blood and not explicitly associated with adverse effects (Eisler 1988). Among mammals, body burdens appear to be highest in insectivores, followed by herbivores and then granivores (Eisler 1988).

Cats administered lead through a diet of contaminated voles accumulated lead in kidneys, liver, and in bone with the concentration being highest in bone (Eisler 1988). Similarly, sheep fed lead in the diet accumulated lead in kidneys and in bone, with higher concentrations in bone (Eisler 1988). Biomagnification of lead in terrestrial food chains is not known to occur (ATSDR 2007).

Skeletal materials tend to be sites of lead accumulation in animals. In *Daphnia magna,* most of the body burden of lead has been found adsorbed to the exoskeleton; adsorption to the exoskeleton has also been noted in crayfish (Eisler 1988). In vertebrates, lead is often bound to bone, teeth, feathers, and other hard tissues (Eisler 1988). In birds, organolead compounds such as trialkyllead can accumulate in the kidney (Eisler 1988).

In aquatic systems, algae and benthic organisms tend to contain higher concentrations of lead than top predators (ATSDR 2007). Studies in rooted aquatic plants showed that powdered lead in water was more available to plants than lead shot, that lead was primarily taken up passively, and that elimination was rapid but not complete (Eisler 1988). Aquatic plants can also take up lead from sediment (Eisler 1988). In a freshwater food chain, lead content accumulated most in algae, followed by daphnids, and finally guppies (Eisler 1988). In a study of an Oklahoma pond, plankton, benthos, and mosquitofish accumulated lead in the same order, from sediments containing lead (Eisler 1988). Toads fed contaminated worms accumulated lead in bone, skin, muscle, kidney, and liver (Eisler 1988). Aquatic organisms can also bioconcentrate organolead compounds, although elimination may be rapid. As with terrestrial food chains, biomagnifications of lead or organolead compounds in aquatic food chains is not known to occur (ATSDR 2007).

Salamanders exposed to lead in water and sediment, accumulated lead on a whole-body basis, but this was not significantly different than reference samples (Roe et al. 2006). In two species of anuran frog, body burdens of lead tended to be higher in larvae than in metamorphs or adults (Roe et al. 2005).

13.4 Toxicity

Lead is not an essential element, is toxic in most chemical forms, and causes metabolic poisoning from a variety of exposure pathways. Tetraalkyl lead compounds are lipophilic and may be metabolized to trialkyllead compounds; these tend to accumulate in tissues such as the liver, brain, and eggs, where they may cause physiological and neurological problems. Most animals acquire lead via the diet; deficiencies or excesses of many dietary components, such as calcium, zinc, iron, and copper, can exacerbate lead poisoning. Organolead compounds are more toxic than inorganic lead, especially forms such as tetraethyl lead.

Lead is generally toxic to aquatic biota, especially as ionic lead, at elevated water temperature, at lower pH and hardness, at early life stages, and after longer exposures. Toxic effects of lead in terrestrial plants may include reductions in photosynthesis, chlorophyll synthesis, adenosine triphosphate synthesis, water

absorption, and transpiration; disruption of cell division and respiration; acceleration of abscission or defoliation; and growth. Chronic exposure to lead may result in a host of adverse effects in fish, including skeletal deformities; anemia; caudal pigmentation and degeneration; damage to the neurological and respiratory systems; enzyme inhibition, chemistry changes, and damage to the blood, spleen, liver, kidney, and gonads; reduced swimming ability and muscular atrophy; and inhibition of reproduction, growth, and survival. In adult frogs, lead poisoning may manifest with sluggishness, decreased muscle tone, sloughing of skin, decreases in blood cells, gastric erosion, and neurological signs. Effects on physiology, pathology, metamorphosis, survival have been noted in frogs and salamanders at various concentrations and exposure periods.

In birds and mammals, organolead compounds generally are associated with greater toxicity and younger animals are more sensitive. Adverse effects on the hematopoietic, nervous, renal, cardiovascular, reproductive, immune, and skeletal systems have been observed, including carcinogenesis in rats and mice.

14. Manganese

14.1 Overview

Manganese is a naturally-occurring element and an essential nutrient. Comprising approximately 0.1 percent of the earth's crust, it is the twelfth most abundant element and the fifth most abundant metal. Manganese exists in both inorganic and organic forms. An essential ingredient in steel, inorganic manganese is also used in the production of dry-cell batteries, glass and fireworks, in chemical manufacturing, in the leather and textile industries and as a fertilizer (ATSDR 2008). The inorganic pigment known as manganese violet (manganese ammonium pyrophosphate complex) has nearly ubiquitous use in cosmetics and is also found in certain paints. Organic forms of manganese are used as fungicides, fuel-oil additives, smoke inhibitors, an anti-knock additive in gasoline, and a medical imaging agent. The principal uses of manganese are in the manufacturing of steel and alloys (ferromanganese and copper manganese) (Budavari 1996). Manganese compounds may also be released to the environment through their use in batteries, electrical coils, ceramics, matches, glass, dyes, fertilizers (manganese sulfate), oxidizing agents, antiseptics (potassium permanganate), catalysts (manganous acetate), pesticides (potassium permanganate), pigments (manganese sulfate), antiknock agents (methylcyclopentadienyl manganese tricarbonyl), and as animal food additives (manganese sulfate, manganese carbonate). Other important anthropogenic sources of manganese include industrial emissions, combustion of fossil fuels, and landfills (Klaassen et al. 1995; Pisarczyk 1995; Lewis 1997; Reidies 1990; Ashford 1994; ATSDR 2008).

14.2 Environmental Fate and Transport

Manganese does not exist in nature as an elemental form, but is found mainly as oxides, carbonates, and silicates in over 100 minerals with pyrolusite (manganese dioxide) as the most common naturally-occurring form. Manganese is released into waterways mainly through the erosion of rocks and soils, mining activities, and industrial waste, or by the leaching of manganese from anthropogenic materials discarded in landfills or soil, such as dry-cell batteries (ATSDR 2008). Manganese compounds are important soil constituents. Manganese is multi-valent and can exist in eleven oxidation states: -III, -II, -I, 0, +I, +II, +III, +IV, +V, +VI, and +VII. However, only the +II, +III, and +IV oxidation states are commonly found in the environment. Manganese +II is the most common dissolved oxidation state in water, while manganese +III and +IV compounds are relatively insoluble. Organic matter may reduce manganese +III and +IV compounds, resulting in the formation of soluble manganese +II. Insoluble manganese compounds are formed under aerobic conditions, and soluble compounds are formed under anaerobic conditions from reduction reactions by microorganisms. Soluble manganese compounds are relatively mobile and may leach into surface or groundwater (Bodek et al. 1988). Soluble manganese is released from soil through ion exchange when replaced by more strongly binding metals such as copper, zinc, or nickel (Bodek et al. 1988). Reducing the soil pH and the soil aeration increases the solubility of manganese in soil (WHO 1981). In soils, manganese is known to interact with several other elements. Most prominently, manganese is observed to interfere with

the availability of cobalt to plants from soils via a strong affinity of manganese oxides to native cobalt. Also, in acidic soils that contain a large amount of manganese, iron absorption by plants can be affected. Interactions also are known to occur between manganese and other metals including cadmium, lead, zinc, and phosphorus (ATSDR 2008).

The transport and partitioning of manganese in water is controlled by the solubility of the specific chemical form present, which in turn is determined by pH, oxidation reduction potential, and the characteristics of the available anions. Mn (+II) [represented by, for example, the manganous ion (Mn^{+2})] dominates in most waters (pH 4–7), but may become oxidized under alkaline conditions at pH >8 (USEPA 1984). The principal anion associated with Mn^{+2} in water is usually carbonate, and the concentration of manganese is limited by the relatively low solubility (65 mg/L) of manganese carbonate (Schaanning et al. 1988). Under oxidizing conditions, the solubility of Mn^{+2} may be controlled by manganese oxide (Ponnamperuma et al. 1969), with manganese being converted to the +III or +IV oxidation states (Rai et al. 1986). In extremely reduced water, the fate of manganese tends to be controlled by formation of a poorly soluble sulfide (USEPA 1984).

14.3 Uptake and Bioaccumulation

Manganese in water may be significantly bioconcentrated at lower trophic levels (Thompson et al. 1972). A discrepancy between lower and upper trophic levels indicates that the potential for biomagnifications of manganese is low.

While it is well established that prolonged oral exposure to excess manganese can result in increased tissue concentrations in animals, the correlations among exposure concentrations, tissue burdens, and health effects have not been thoroughly investigated (ATSDR 2008). Gastrointestinal absorption (and hence the toxicity) of manganese is inversely related to dietary iron concentrations. Conversely, high concentrations of dietary manganese lead to decreased iron absorption. The presence of dietary copper and cadmium as well as high concentrations of phosphorous and calcium may also reduce manganese uptake (ATSDR 2008).

14.4 Toxicity

Manganese is an essential nutrient associated with growth, normal functioning of the central nervous system, and reproductive function. Manganese deficiency in animals is demonstrated by a reduced growth rate, skeletal abnormalities and abnormal reproductive function. In general, manganese compounds have low acute oral toxicity when provided in feed. However, high levels of manganese may produce neurotoxic responses such as hypoactivity, nervousness, tremors, and ataxia. Other reported effects include liver damage and decreased growth.

Manganese is essential in plant nutrition for the oxidation-reduction process. Specifically, manganese participates in the oxygen-evolving system of photosynthesis and in the photosynthetic electron transport system. In the soluble form, manganese is easily taken up from soils by plants and is rapidly translocated throughout the plant. Manganese deficient plants exhibit decreased growth, interveinal chlorosis, necrotic spots on leaves, and browning of roots. Manganese toxicity is demonstrated in plants by iron chlorosis, leaf puckering, necrotic brown spots, and an uneven distribution of cholorphyll in older leaves.

15. Mercury

15.1 Overview

Mercury is a naturally-occurring metal found throughout the environment. Its many forms are commonly grouped into three classifications: metallic or elemental mercury [in the 0 oxidation state; i.e., Hg(0)], inorganic mercury, and organic mercury. Metallic mercury is the elemental or pure form of mercury. Inorganic mercury compounds, also known as mercury salts, occur when mercury combines with elements such as chlorine, sulfur, or oxygen. When mercury combines with carbon, the compounds formed are called "organic" mercury compounds or organomercurials, of which methylmercury is the most common.

Mercury is mined as cinnabar ore, which contains mercuric sulfide. The metallic form is refined from mercuric sulfide ore and used to produce chlorine gas and caustic soda and in extracting gold from ore or articles that contain gold. It is also used in thermometers, dental fillings, barometers, batteries, and electrical switches. Some inorganic mercury compounds are used as fungicides (ATSDR 1999). Other inorganic salts of mercury, including ammoniated mercuric chloride and mercuric iodide, have been used in skin-lightening creams or as topical antiseptic or disinfecting agents. Chemicals containing mercury have also been used as antibacterial and medicinal products, including mercurochrome, and thimerosal and phenylmercuric nitrate. Mercuric sulfide and mercuric oxide may be used in paints and dyes (ATSDR 1999).

Most of the mercury found in the environment is in the form of metallic mercury and inorganic mercury compounds. These compounds enter the environment as the result of the normal breakdown of minerals in rocks and soil. Human activities including coal-fired power plants, mining, smelting, and solid waste incineration age have resulted in additional release of mercury to the environment (ATSDR 1999). Mercury is also released to the soil from fertilizers, fungicides, and municipal solid waste containing discarded batteries, electrical switches, or thermometers, as well as from industrial waste water.

15.2 Environmental Fate and Transport

Mercury exists in four oxidation states: 0, +I, +II, and +IV. In soils and surface waters, mercury exists in the mercuric (+II) and mercurous (+I) oxidation states as a number of complex ions with varying water solubilities. Mercuric mercury, present as complexes and chelates with ligands, is usually the predominant form of mercury in surface waters. The transport and partitioning of mercury in surface waters and soils is influenced by the particular form of the compound. More than 97 percent of the dissolved gaseous mercury found in water is elemental mercury (Vandal et al. 1991). Volatile forms (e.g., metallic mercury and dimethylmercury) are expected to evaporate to the atmosphere, whereas much of the remaining mercury partitions to particles in the soil or water column and is transported downward in the water column to the sediments (Hurley et al. 1991). The dominant process controlling the distribution of mercury compounds in

the environment appears to be the sorption of nonvolatile forms to soil and sediment particulates, with little resuspension from the sediments back into the water column (Bryan and Langston 1992).

Mercury discharged into rivers, bays, or estuaries as elemental (metallic) mercury, inorganic divalent mercury, phenylmercury, or alkoxyalkyl mercury can be converted into methylmercury compounds by natural processes depending on mercury loadings, microbial activity, nutrient content, pH and redox condition, suspended sediment load, sedimentation rates, and other variables (Eisler 1987). Methylmercury and other mercury fractions are strongly bound to organic matter in water and may be transported in runoff water from contaminated lakes to other surface waters and soils (Lee and Iverfeldt 1991). Contaminated groundwater can sometimes transport low concentrations of mercury (2 to 4 nanograms per liter) into overlying lakes, with concentrations reaching a maximum near the sediment/water interface; however, since most of the mercury in the groundwater is derived from atmospheric sources, this low value indicates that most of the mercury deposited on soil (92 to 96 percent of the 10.3 micrograms per square meter/year of mercury deposited) is absorbed to the soil and does not leach down into the groundwater (Krabbenhoft and Babiarz 1992). Methylmercury is much more soluble and mobile than the inorganic forms and quickly enters the aquatic food chain.

15.3 Uptake and Bioaccumulation

Because it is lipophilic, methylmercury is accumulated to a much greater extent in biological tissue than are inorganic forms of mercury, with highest concentrations in the liver and brain. Because the rate of methylation increases as pH decreases, bioaccumulation usually is greater in waters with lower pH (Ponce and Bloom 1991). Mercury concentrations in fish have also been negatively correlated with other water-quality factors, such as alkalinity and dissolved oxygen content (Wren 1992). The uptake of mercury into fish may also be reduced by the presence of selenium (Bjerregaard et al. 2011). The biomagnification of methylmercury has been widely demonstrated by the elevated levels found in piscivorous fish compared with fish at lower levels of the food chain (Kohler et al. 1990; Porcella 1994; Watras and Bloom 1992). Hall et al. (1997) found that food was the predominant source of mercury uptake in fish.

15.4 Toxicity

The effects of mercury on natural resources are influenced by interactions with the surrounding matrix, the lifestage of the organism, and the form of mercury. In general, early developmental stages are the most sensitive, and organomercury compounds –especially methylmercury – are more toxic than inorganic forms. In addition, when mercury and selenium occur together, they appear to have an antagonistic relationship, reducing the observed toxicity (Bjerregaard et al. 2011). PCBs have also been shown to have antagonistic effects with mercury (Vettori et al. 2006).

In general, mercury can adversely affect biochemical, reproductive, neurological, growth, and survival endpoints in a suite of organisms. The remainder of this section contains a brief, resource-specific review of the toxicological effects of mercury on plants, aquatic invertebrates, fish, amphibians and reptiles, birds, and mammals.

The effects of mercury on plants depend on a variety of factors such as species, seasonal growth changes, and the organ exposed (Thomas and Mantes 1978). For example, mercury effects in algae include, but are not limited to, bleaching of individual cells, cell size changes and destruction of whole cells (Thomas and Mantes 1978). The authors report growth-related inhibitory effects in *Anabaena* at a methylmercuric chloride concentration as low as 1 part per billion (ppb) (Thomas and Mantes 1978). Stanley (1974) examined the effects of mercury contamination in the aquatic plant *Miriophyllum spicatum*. He showed that mercuric chloride water concentrations of 3.4 ppm resulted in 50 percent inhibition of root weight.

The effects of mercury on aquatic invertebrates vary widely across species, and depend on abiotic factors such as temperature, salinity, and hardness. In general, organisms in the larval stage are the most sensitive, and levels of 1 to 10 ppb can cause acute toxicity at this stage (Boening 2000). Potential effects include, but are not limited to, decreased growth and reproduction and increased mortality (Boening 2000). The World Health Organization reports a concentration lethal to 50 percent of test organisms (LC_{50}) for the freshwater invertebrate *Lamellidens maginalis* at water concentration of 5.9 ppm of inorganic mercury (Boening 2000).

Literature on mercury toxicity to fish is robust, and studies identify a suite of effects. For example, fish exposed to mercury experienced reduced growth, reduced spawning success, impaired gonadal development, and reduced immune function, among other effects (Hammerschmidt et al. 2002; Friedmann et al. 1996). Sandheinrich and Wiener (2011) demonstrate that fish species experience adverse effects at tissue concentrations well below 1.0 ppm wet weight (ww) whole body: changes in biochemical processes, damage to cells and tissues, and effects on reproduction occurred at mercury concentrations of approximately 0.3 to 0.7 ppm ww in whole body.

Limited information on mercury toxicity in amphibians and reptiles is available, but mercury has been associated with a variety of immunotoxic, endocrine, and reproductive disorders in some species (Grillitsch and Schiesari 2010). Highest tissue concentrations are consistently found in the livers and kidneys of reptile species (Grillitsch and Schiesari 2010). Reptiles such as garter snakes reported no signs of mercury toxicity at concentrations of 200 ppb (Wolfe et al. 1998). Amphibians are more sensitive; the World Health Organization reports LC_{50} at the larval and embryo stages (the most sensitive stages) at water concentrations as low as 1.3 ppb of inorganic mercury (Boening 2000).

In birds, signs of mercury poisoning include decreased food intake, decreased growth, increased enzyme production, blood parameter changes, decreased immune response, affected kidney function and structure, and behavioral changes (Boening 2000). Impaired reproduction (eggs without shells, reduced hatchability, unfertilized eggs) has also been reported in laboratory studies (Shore et al. 2011). In aquatic systems, piscivorous birds tend to have higher mercury levels than non-fishing birds (Boening 2000). Burgess and Meyer (2008) looked at the effects of methylmercury exposure from fish consumption associated with reduced reproduction in common loons. They found that loon reproduction dropped by 50 percent when fish mercury levels where 0.21 ppm ww, and failed completely at fish mercury levels of 0.51 ppm ww.

Methylmercury affects the central nervous system in mammals, including sensory, visual, and auditory areas, with more severe effects leading to widespread brain damage (Eisler 1987). Concentrations reportedly associated with reproductive effects for mammals fall within the range associated with lethality (Shore et al. 2011). For mink, body burden concentrations of 5 ppm resulted in ataxia, loss of balance, anorexia, loss of weight, and subsequently death (Aulerich et al. 1974). Wren et al. (1987) fed mink a diet containing 1 ppm of methylmercury for 3 months. This resulted in the death of approximately 50 percent of the population during that time period.

16. Molybdenum

16.1 Overview

Molybdenum is a comparatively rare element that is used primarily in the manufacture of steel alloys for the aircraft and weapons industries. Most of the recent global production of about 100,000 tons annually comes from the United States–primarily Colorado. Anthropogenic activities that have contributed to environmental molybdenum contamination include combustion of fossil fuels, and smelting, mining, and milling operations for steel, copper, and uranium, as well as for molybdenum. In general, the chemistry of molybdenum is complex and inadequately known. Its toxicological properties are governed to a remarkable extent by interactions with copper and sulfur, although other metals and compounds may confound these relationships (Eisler 1989).

Molybdenum does not occur free in nature and is found only in combination with sulfur, oxygen, tungsten, lead, uranium, iron, magnesium, cobalt, vanadium, bismuth, or calcium. The most economically important ores are molybdenite (MoS_2), jordisite (amorphous MoS_2), and ferrimolybdate ($FeMoO_3$ - H_20); less important are wulfenite ($PbMoO_4$), powellite ($CaMoO_4$), and ilsemannite (Mo_3O_8) (Friberg et al. 1975; Chappell et al. 1979; Friberg and Lener 1986; Goyer 1986).

As a result of various human activities, molybdenum enters the environment from many sources (King et al. 1973; Friberg et al. 1975; Chappell et al. 1979). Coal combustion is the largest atmospheric source of molybdenum, contributing about 550 metric tons annually, or 61 percent of all atmospheric molybdenum worldwide that comes from anthropogenic sources. Molybdenum mining and milling are the source of about 100 metric tons annually to aquatic systems. At the formerly operating largest molybdenum mine in the world in Climax, Colorado, about 36,000 tons of tailings were generated daily, releasing up to 100 tons of molybdenum annually as aqueous effluent. Other sources are molybdenum smelting, uranium mining and milling, steel and copper milling, oil refining, shale oil production, and claypit mining (Eisler 1989).

16.2 Environmental Fate

Molybdenum has ten oxidation states: -III, -II, -I, 0, +I, +II, +III, +IV, +V, and +VI. In oxic waters, the molybdate ion (MoO_4^{-2}, in the +VI oxidation state) is the most common form. Molybdenum concentrations tend to be elevated in nonbiological materials and in terrestrial flora in the vicinity of molybdenum mining and reclamation activities, fossil-fuel power plants, and disposal areas for molybdenum-contaminated sewage sludge, fly ash, and irrigation waters. Concentrations of molybdenum in fish, wildlife, and invertebrates were low when compared to those in terrestrial plants, although some aquatic invertebrates were capable of high bioconcentration. Concentrations of molybdenum alone, however, were not sufficient to diagnose molybdenum deficiency or toxicosis. Molybdenum is concentrated in coal and petroleum, and the burning of these fuels contributes heavily to atmospheric molybdenum (King et al. 1973). Background

molybdenum concentrations in ground and surface waters rarely exceed 20 micrograms per liter (µg/L) (Eisler 1989).

16.3 Uptake and Bioaccumulation

Algal uptake of molybdenum is rapid during the first 2 hours (Sakaguchi et al. 1981). Uptake is greater in freshwater than seawater, greater at increased exposure concentrations, and greater at reduced algal densities (Sakaguchi et al. 1981). It is also greater at elevated temperatures (Penot and Videau 1975).

In mammals, molybdenum uptake and accumulation is complicated by the presence of copper and sulfate. Copper reduces accumulation of molybdenum in the liver and may decrease the absorption of molybdenum from food, especially in the presence of sulfate (Goyer 1986). A low copper: molybdenum ration (<2), rather than the absolute dietary concentration of molybdenum, is the primary determinant of susceptibility to molybdenum poisoning: molybdenosis is not expected when this ratio is near 5 (Buck 1978; Ward 1978; Mills and Breamer 1980).

16.4 Toxicity

The effects of molybdenum on natural resources are influenced by interactions with the surrounding matrix. Gupta and Lipsett (1981) concluded that molybdenum is essential for plant growth due to its role in the fixation of nitrogen by bacteria using the enzymes nitrogenase and nitrate reductase. Cattle are especially sensitive to molybdenum poisoning, followed by sheep, under conditions of copper and inorganic sulfate deficiency. Cattle were adversely affected when grazing pastures with a copper to molybdenum ratio of <3, or when fed low copper diets containing molybdenum. Other mammals are relatively tolerant to molybdenum. Deer are at least 10 times more resistant than domestic ruminants to molybdenum (Eisler 1989). No data regarding the toxicity of molybdenum to plants or amphibians and reptiles were found.

17. Nickel

17.1 Overview

Nickel is a relatively abundant metal that occurs naturally in the earth's crust. Nickel may be mined or recovered from scrap and is usually used in alloys with copper, chromium, iron, molybdenum, silver, zinc, aluminum, iron, and other metals. Uses for these alloys include industrial plumbing, marine and petrochemical equipment, heat exchangers, pumps, welding electrodes, coinage, heating elements, gas-turbine engines, tableware coatings, electrical contacts, catalysts, steels, and magnets. Nickel and nickel salts are also used in electroplating, ceramics, pigments, catalysts, and batteries (ATSDR 2005).

Nickel is released to the environment from both natural and anthropogenic sources, although anthropogenic releases are greater. Natural releases of nickel may result from windblown dust, volcanic emissions, vegetation, forest fires, meteoric dust, and soil erosion. Most anthropogenic releases of nickel in the United States are to soil. Anthropogenic releases of nickel to air, water, and soil may result from nickel mining, smelting, and refining; manufacture of nickel-containing alloys such as steel; combustion and power generation from wood and fossil fuels; incineration of wastes; other industrial effluent and waste releases related to inorganic chemicals, batteries, metals manufacture, porcelain enameling, and paints and inks; domestic wastewater and sewage sludge; urban runoff; and landfill waste and landfill leaching (ATSDR 2005).

17.2 Environmental Fate and Transport

Nickel exists in multiple oxidation states, including -I, 0, +I, +II, +III, and +IV; however, only divalent nickel [Ni(+II)] is commonly found in the environment (ATSDR 2005). Like most metals, nickel can be incorporated into a variety of compounds for which solubility in water varies from soluble (e.g., nickel nitrate, and nickel sulfate) to moderately soluble or insoluble (e.g., nickel sulfide, nickel oxide, and metallic nickel).

In water, nickel tends to strongly complex with or adsorb to waterborne materials, including dissolved organic matter; hydroxide, sulfate, and carbonate, which form soluble complexes; iron, which forms insoluble nickel ferrite in aerobic water; and iron, manganese, and aluminum oxides (ATSDR 2005). Thus, nickel is generally expected to exist as the hexahydrated divalent nickel cation (represented simplistically as Ni^{+2}), as a soluble complex or in suspended particulate matter that is removed by sedimentation (ATSDR 2005). Ni^{+2} can dominate the speciation of dissolved nickel at pH values lower than 9 (ATSDR 2005).

Sediment is an important sink for nickel, which tends to be associated with fine-grained sediments and high organic carbon content (Eisler 1998). However, under anaerobic conditions, microbial actions involving nickel sulfide or iron can lower the pH of sediment and enhance mobility of nickel (ATSDR 2005).

Nickel is strongly adsorbed to soil, but leaching is possible under certain conditions such as low pH. Nickel may be more mobile than lead, cadmium, copper, and zinc (ATSDR 2005). Nickel adsorbs to iron and manganese oxides and to clay minerals, especially in alkaline soils, although calcium, magnesium, sulfate and other ions may reduce adsorption via cation competition (calcium and magnesium) and complexation (sulfate) (ATSDR 2005). Nickel adsorptivity may be higher in the presence of organic matter (ATSDR 2005).

17.3 Uptake and Bioaccumulation

Some species of terrestrial plants can take up and accumulate nickel from soil, but biomagnification in the terrestrial food chain does not occur (ATSDR 2005). Uptake may be greater at low pH and low organic matter content (ATSDR 2005).

Nickel has not been reported to accumulate significantly in aquatic biota, except possibly in aquatic plants. Where uptake does occur, concentrations tend to be higher in gills and in organs such as the hepatopancreas and liver (Eisler 1998). Canada (1994) noted that benthic organisms could accumulate higher concentrations than pelagic organisms. Nickel has not been found to biomagnify in aquatic food webs, and concentrations in biota are usually lower at higher trophic levels (ATSDR 2005).

A study in toads suggested that females and their eggs did not accumulate nickel at a coal-ash contaminated site despite elevated concentrations of nickel in water and soil (Hopkins et al. 2006). In two species of anuran frog, body burdens of nickel tended to be higher in larvae than in metamorphs or adults, but there were some differences in accumulation between species and similarities in accumulation across the reference site and contaminated areas (Roe et al. 2005).

In mammals, most nickel in the diet is not absorbed through the gastrointestinal tract, and any that is absorbed is typically cleared rapidly in urine (Eisler 1998). External tissues such as fur and skin tend to accumulate the highest concentrations of nickel, while internal organs may accumulate similar concentrations regardless of the degree of contamination in environmental media (Eisler 1998). However, in herbivorous mammals, nickel appears to accumulate most in bone, reproductive organs, and kidneys (Eisler 1998). Increasing age is more likely to be associated with higher body burdens of nickel in mammals than sex, reproductive state, or trophic position, and nickel does not appear to be easily transferred in utero (Eisler 1988).

17.4 Toxicity

Nickel is an essential element for metabolism and growth in plants (USEPA 2007). Nickel does not have a clear biochemical function in birds or mammals (USEPA 2007), but dietary deprivation in laboratory animals has produced alterations to liver, skin, skeleton, and blood and tissue chemistry; impaired reproduction; and decreased growth and survival (Eisler 1998). Nickel may interact with many chemicals such as barium,

cadmium, calcium, chromium, cobalt, copper, iodine, iron, magnesium, manganese, molybdenum, phosphorus, potassium, sodium, zinc, chelating agents, and PAHs, any of which may alter the nature and magnitude of nickel toxicity (Eisler 1998). Nickel is generally considered not carcinogenic by ingestion, but some nickel compounds show weak mutagenicity and the potential to induce reproductive or development effects (Eisler 1998).

Acute and chronic effects in aquatic invertebrates and fish may include genotoxicity, tissue damage, and decreased growth, but tolerance may vary widely. In freshwater, increased hardness tends to reduce the toxicity of nickel in water (USEPA 1986). Nickel is also less toxic to algae at lower concentrations of copper and higher concentrations of chelating agents (Eisler 1998) and more lethal to freshwater crustaceans and fish at slightly acidic pH compared to more alkaline pH (Eisler 1998).

At chronic low levels of exposure to nickel, terrestrial plants may show only growth inhibition; other signs of nickel toxicity include wilting, chlorosis, necrosis, stunting, discoloration, inhibition of germination, and abnormal morphology and growth (Eisler 1998; Canada 1994). Excess nickel causes reductions in enzyme activity, photosynthesis, and growth in algae (Eisler 1998), but tolerance may vary.

Aquatic insects such as chironomids may be more tolerant of nickel than crustaceans and mollusks (Canada 1994). Hematological effects such as hyperglycemia, lymphopenia, and erythrocytosis have been observed in fish in association with nickel toxicity (USEPA 1986). Other signs of poisoning include decreased glycogen in the muscle and liver and other biochemical abnormalities; surfacing and rapid mouth and opercular movements, probably caused by destruction of gill lamellae; convulsions; equilibrium disruption; and death (Eisler 1998).

Relatively few toxicity data were identified for amphibian or reptile species. Divalent nickel may produce teratogenic effect in amphibians, such as malformations of the eyes, skeleton, head, heart, and intestines (Eisler 1998). Nickel levels reported in the tissues of amphibians exposed to coal combustion waste have not been firmly linked to observed reproductive and developmental effects (Hopkins et al. 2006; Roe et al. 2006).

Abnormalities in feces, growth, and survival of mallards and chickens have been associated with exposure to nickel (Eisler 1998). In mammals, ingested nickel is less toxic than inhaled nickel. Additionally, sensitivity may differ widely between closely related species, but juveniles are usually more sensitive than adults (Eisler 1998). Dietary exposure to nickel compounds such as nickel carbonate, nickel chloride, and nickel sulfate may case disruption of food intake and thyroid function, reduced growth, emphysema, and pneumonia in laboratory and domestic mammals (Eisler 1998).

18. Selenium

18.1 Overview

Selenium is a naturally-occurring mineral found nearly ubiquitously in the environment, commonly encountered in rocks and soils. Although selenium is an essential micronutrient, it can also be toxic to biota with a narrow range between beneficial and toxic. In nature, selenium typically co-occurs with sulfur, including in metal-sulfide ores of silver, copper, lead, and nickel. The majority of selenium for human use is centered in the electronics industry but it is also used as a nutritional supplement for both humans and livestock, in the glass industry, as a pigment in various products, in the preparation of pharmaceuticals, in diagnostic medicine, and as an ingredient in pesticides, shampoos, and fungicides (ATSDR 2003).

The primary source of selenium in the environment is natural sources although anthropogenic sources also contribute (Eisler 1985). Natural sources include the weathering of selenium containing sedimentary rocks and soils, volcanic eruptions, leaching, and runoff. Localized selenium-enriched geological formations can also be a natural source of the chemical (Chapman et al. 2010). The principle anthropogenic source of selenium is fossil fuel combustion, with coal being the primary source. Other anthropogenic sources include oil combustion, mining, and wastes from agricultural and industry (ATSDR 2003). The worldwide contribution of selenium to the environment from anthropogenic activities is estimated to be 6.4 M kg/y (Chapman et al. 2010). Selenium can enter the environment as dust from emissions, or natural sources, and eventually settles over land and water.

18.2 Environmental Fate and Transport

Selenium is classified as a non-metal but may behave as a metalloid (Chapman et al. 2010). Selenium exists in six oxidation states: -II, 0, +I, +II, +IV, and +VI. The oxidation state of selenium in the environment is dependent on ambient conditions including pH, Eh, and biological activity (ATSDR 2003). Selenium is typically hydrolyzed in aqueous solutions to form oxyanions including selenite (SeO_3^{-2}; i.e., the +IV oxidation state of selenium) and selenate (SeO_4^{-2}; i.e., the +VI oxidation state of selenium). These forms typically have increased solubility and mobility with increasing pH (Chapman et al. 2010). The non-metallic nature of selenium is crucial to understanding its fate and transport, which are closely linked to both speciation and biotransformation. Selenium occurs in forms that are analogous to sulfur and can include elemental selenium (Se^0; i.e., the 0 oxidation state), selenide (Se^{-2}; i.e., the –II oxidation state), selenite, selenate and organic selenium compounds [e.g., methylated forms ($Se_x[CH_3]_y$) and in amino acids, in which selenium can be in a variety of oxidation states).

Selenium compounds released to the atmosphere are deposited in soil and surface water, increasing the concentration in each over time. Selenium also accumulates in agricultural drainage waters and retention basins in arid and semi-arid environments (ATSDR 2003, Chapman et al. 2010). In the water column in

aquatic environments, selenium is often found as the oxidized inorganic anions, selenate and selenite. Small amounts of dissolved organic selenium compounds are also often present due to biological activity (Chapman et al. 2010). Sodium selenate is one of the most mobile forms due to its high solubility and inability to absorb onto soil (ATSDR 2003). Selenium in the aquatic environment is readily bioaccumulated by aquatic organisms with organisms at the base of the food chain bioaccumulating high concentrations of selenium that are then transferred to organisms at higher trophic levels (ATSDR 2003).

18.3 Uptake and Bioaccumulation

The biogeochemistry of selenium and mechanisms of entry into living cells are very complex (Chapman et al. 2010.). As previously noted, selenium enters the environment from both anthropogenic and natural inputs as the oxidized inorganic anions selenate and selenite, and to a lesser extent organic selenium. Selenite and selenate are taken up by microbes, algae, and plants and converted to organic selenium compounds, which are often analogous to sulfur containing biomolecules, especially amino acids (Chapman et al. 2010). Unicellular algae can uptake inorganic as well as organic forms of selenium from low ambient concentrations in fresh water. In green algae uptake of selenate and selenomethionine show that transmembrane transport proteins (i.e., carriers) are involved. No carrier is thought to be involved with the uptake of selenite in green algae because the kinetics are more linear (Chapman et al. 2010). However, carrier-mediated uptake has been reported in cyanobacteria and diatoms (Chapman et al. 2010).

After being taken up by primary producers, selenium is reduced before being incorporated into the amino acids selenocysteine and selenomethionine. Selenomethionine is the primary organic form of selenium in the food chain (Chapman et al. 2010), and is the most relevant to bioaccumulation from trophic transfer and to toxicity. In most organisms, selenium is important in metabolic function because many enzymes and proteins require selenium for activity; these are known as selenoproteins. The discovery of selenoproteins confirmed selenium as an essential nutrient and indicated a role in the defense against oxidative injury (Chapman et al. 2010). Uptake via a carrier has been documented in intestinal and renal cells of humans with an amino-acid transporter being responsible for uptake of selenium through the diet (Chapman et al. 2010). Although it is not well understood, a similar membrane assisted amino-acid transport system is thought to be present in some invertebrates, fish, and birds to support homeostasis of the essential element selenium (Chapman et al. 2010).

Bioaccumulation of selenium is well documented in the literature, however it cannot be predicted based only on the selenium concentration in water (ATSDR 2003, Chapman et al. 2010). Factors such as assimilation efficiency, ingestion rate, and efflux rate must also be considered and can be used to track enrichment in organisms through feeding. Trophic transfer studies have suggested that selenium concentrations can be enriched 100 to 1,000,000 fold in algae, which assimilate selenium directly from water. Moving up the food chain from algae to invertebrates (primary producers to their consumers, which are prey to higher tropic-level predators), concentrations are enriched from 0.6 to 23 times. Moving from invertebrates to fish

(prey to predators), the selenium concentration is again enriched from 1 to 3 times (Chapman et al. 2010). There is evidence to suggest that exposure to selenium may decrease the assimilation of mercury into fish (Bjerregaard et al. 2011).

18.4 Toxicity

Although selenium is a micronutrient, and therefore provides some benefit to biota, it can also be toxic, causing sub-lethal and lethal effects (Hamilton 2004). In aquatic environments, uptake by biota can occur via gills, epidermis, and gut, with dietary exposure being the primary pathway. Once exposed to elevated levels of selenium, the effects on natural resources are dependent on interactions with the surrounding matrices, the life stage and sensitivity of the organism, the chemical form of selenium and the exposure pathway (Chapman et al. 2010; Fordyce 2005; Hamilton 2004; Eisler 1985). In addition, other contaminants affect selenium's toxicity. For example, when mercury and selenium occur together, they appear to have an antagonistic relationship, reducing observed toxicity (Bjerregaard et al. 2011), whereas the arsenic compound arsenite has a synergistic relationship with methylated selenium compounds, enhancing the toxicity of forms of selenium (Kraus and Gather 1989).

In general, selenium can adversely affect biochemical, neurological, growth, developmental, reproductive, and survival endpoints in a suite of organisms. The remainder of this section contains a brief, resource-specific review of the toxicological effects of selenium on plants, aquatic invertebrates, fish, birds, amphibians and reptiles, and mammals.

Selenium is an essential nutrient for growth in plants; however, it can also be toxic at elevated concentrations. Uptake into plants is influenced by the form of selenium present, concentration, pH, and species (USEPA 2007). The toxic effects of selenium on plants generally include, but are not limited to, growth and survival endpoints (Eisler 1985). For example, growth was significantly reduced in green algae at tissue concentrations of 4 ppm (Williams et al. 1994, as cited in DOI 1998; Foe and Knight 1986; Vocke et al.1980). Survival endpoints were investigated by Kumar and Prakash (1971), who examined blue-green algae exposed to selenium. After 96 hours, they observed a median LC_{50} at water concentrations of 15 mg/L.

Although invertebrates have been shown to be relatively tolerant to elevated selenium, they can experience selenium-related adverse effects, including reduced biochemical rates, reproduction, and growth (Chapman et al. 2010; DOI 1998). For example, altered respiration rates were found in crayfish caged in the ash-pit drain of a Wisconsin power plant with concentrations of 30 ppm found in the hepato-pancreas (Magnuson et al. 1980). Reduced reproduction and growth resulted when daphnids were exposed for 30 days to 0.348 and 0.156 mg/L, respectively (Ingersoll et al. 1990). Further, a study on potworms reported lethality to 50 percent of the population (LC_{50}) after 42 days of exposure at a soil concentration of 5.69 ppm dw (Somogyi et al. 2007).

Field and laboratory studies on selenium toxicity in fish show effects that include, but may not be limited to, reproductive effects, teratogenic deformities, and mortality (Eisler 1985; Jacobs 1989). Lemly (1996a) recommended a toxicity threshold of 4 ppm dw for whole body, adult fish for mortality of juveniles and reproductive failure, and a 10 ppm dw threshold for ovary/eggs. In Belews Lake, North Carolina, Sorenson et al. (1984) observed reproductive failure, reduced immune and liver functions, and population decline in green sunfish with elevated selenium levels of 0.005 mg/L in water. Laboratory studies of selenium exposure from maternal transfer to embryo for bluegill sunfish showed lowest effect concentration at 16 ppm dw in the ovary/egg, resulting in larval edema, larval mortality, and larval deformities (Coyle et al. 1993, cited in DeForest and Adams 2011). In a long-term study with bluegill sunfish, dietary selenium caused adult and embryo mortality, and maternally-transferred selenium resulted in but larval mortality at even lower dietary concentrations (Chapman et al. 2010).

The literature on selenium toxicity to birds is robust, and studies identify a suite of effects that include, but are not limited to, reproductive effects and mortality. Reproductive impairment is considered the most sensitive indicator of selenium toxicity in birds and has been observed at concentrations as low as 3 ppm dw in the diet of mother birds (Chapman et al. 2010; DOI 1998). Embryos suffer brain tissue, spinal cord, and limb bud deformities at maternal dietary concentrations of 6 to 9 ppm dw. Additionally, reduced egg production and growth were observed at maternal dietary concentrations above 7 ppm dw (Ohlendorf and Heinz 2011; Jacobs 1989; WHO 1987). Wayland et al. (2007) used logistic regression analysis on experimental studies of six species (mallard, American kestrel, domestic chicken, black-crowned night-heron, eastern screech owl, and ring-necked pheasant), and calculated an effects concentration for 10 percent of the population (EC_{10}) for reduced egg hatchability of 4 ppm dw. Further, at Kesterson Reservoir (California), where selenium in runoff from agriculture accumulated at toxic levels of 50 ppm in birds' diets, reproductive failure and adult mortality were observed (Ohlendorf et al.1990; Ohlendorf and Heinz 2011).

Little is known regarding the toxicity of selenium to amphibians and reptiles, but studies have identified histological and growth effects. Larval deformities, deformities of the mouthparts, spinal and oral abnormalities that affected swimming and feeding, reduced growth, altered predator avoidance, reduced larval survival, and altered time and size to metamorphosis have all been reported in various studies in which amphibians were exposed to selenium and other contaminants (Chapman et al. 2010). Effects on reptiles include histopathological differences such as liver necrosis and increased respiratory rates, which indicate a high energetic cost associated with exposure (Chapman et al. 2010). Exposure of reptiles to selenium-laden prey did not affect growth, survival, overwinter survival, or metabolism (Chapman et al. 2010).

Selenium toxicity studies on mammals report immunological and reproductive effects. For example, Peterson and Nebeker (1992) modeled thresholds of waterborne selenium toxicity, and estimated immunological effects thresholds of 0.0009 mg/L for bats and shrews, 0.0011 mg/L for mink, and

0.0007 mg/L for river otters. Similar thresholds (i.e., between 0.001 to 0.002 mg/L were recommended by several studies cited by Lemly (1996b). Further, inhibition of reproductive success and failure to breed was observed in a three generation study of mice exposed to a single dose of selenium at 0.056 ppm in food and 3 mg/L in drinking water (Schroeder and Mitchener 1971).

19. Silver

19.1 Overview

Silver is a rare metal that occurs naturally in the earth's crust, usually as a sulfide associated with iron, lead, tellurides, or gold (ATSDR 1990). Accordingly, most silver is produced as a by-product during extraction or processing of copper, lead, zinc, gold, nickel, or platinum (ATSDR 1990; WHO 2002). Silver is also produced secondarily by recycling industrial and consumer scrap. Silver is used in photographic materials (although much less in recent years than in the past); electrical contacts, paint, batteries, and other electronic applications; brazing alloys and solders; electroplating for jewelry and other consumer goods; mirrors; water purification; burn treatments, antibacterials, and other medical applications; cloud seeding; and chemical analyses and catalyses. Past uses have also included coinage, medical prostheses and splints, dental materials, and bearings (ATSDR 1990).

Silver is released to the environment from both natural and anthropogenic sources, although anthropogenic releases are estimated to be greater. Natural releases of silver to the environment result from weathering and soil erosion. Most anthropogenic releases of silver are to land via solid waste disposal, followed by surface water and the atmosphere. Anthropogenic releases result from metals production (ore processing, refining, smelting, milling), use in electrical machinery, fossil fuel combustion, cement manufacture, municipal waste incineration, cloud seeding, photographic effluent and waste, sewage treatment and sludge, runoff, other industrial effluents and waste, use in brazing alloys and solders, urban refuse, and leaching from tailings ponds and piles associated with mines (ATSDR 1990).

19.2 Environmental Fate and Transport

Silver exists in four oxidations states, of which the first two are most common: 0, +I, +II, and +III. Silver sulfide (Ag_2S) and associations with lead, copper, iron, and gold sulfides are particularly important in the environment; silver also readily forms compounds with antimony, arsenic, selenium, and tellurium (WHO 2002). As for many inorganics, silver compounds range from insoluble or not very soluble (e.g., metallic silver, silver sulfide, silver chloride) to soluble (e.g., silver nitrate) in water (ATSDR 1990, WHO 2002). Under oxidizing conditions, chlorides, bromides, and iodides are expected to dominate, while the sulfide and free metal are expected to dominate under reducing conditions (ATSDR 1990).

In surface water, silver is expected to be primarily in dissolved form as a monovalent or complex ion (e.g., with sulfide and other reduced-sulfur ions, bicarbonate, sulfate, chloride, or ammonium), with a smaller portion adsorbed onto humic complexes or suspended particulate matter (ATSDR 1990). In freshwater, silver can also form soluble organic compounds such as silver acetate or silver tartrate (ATSDR 1990). The concentration of monovalent silver ion is negligible in the natural environment (WHO 2002), and a colloidal mixture of inorganic and organic materials, generally involving sulfur, comprises the most important forms of

silver in water. In estuarine and marine environments, chloro complexes that retain some silver in dissolved form increase in concentration (WHO 2002). However, most silver is expected to eventually precipitate, deposit, or sorb to sediments through processes affected by pH and oxidation reduction conditions, especially in association with manganese dioxide, ferric compounds, or fine-grained sediments (WHO 2002). In areas of abundant decaying matter and other reducing conditions, silver can be reduced to metallic silver or silver sulfide or combine with humic materials (WHO 2002). The affinity of silver for compartments other than water is shown in the strong ability of sewage treatment processes to remove much, although not all silver; however, re-release of silver to water from sediment is possible (WHO 2002).

In soils, silver tends to be much less mobile, especially at higher pH and in poorly drained soil. Mobility is also reduced in the presence of organic matter (which can sorb or form complexes with silver) and under pH and oxidation reduction conditions that encourage precipitation to insoluble compounds or reaction with clays and iron and manganese complexes (ATSDR 1990; WHO 2002).

19.3 Uptake and Bioaccumulation

Uptake of silver into terrestrial plants can result from atmospheric deposition to leaves or from root uptake from soil (ATSDR 1990). Seeds, nuts, fruits, or roots typically contain more silver than other plant parts (WHO 2002). However, accumulation in plants is generally low (WHO 2002).

The bioavailability, uptake, and accumulation of silver by aquatic organisms are controlled by factors such as salinity, silver speciation and concentration, and silver adsorption to suspended sediments and phytoplankton. Silver uptake has generally been found to be rapid, inversely proportional to salinity, and directly proportional to silver concentration. As salinity increases, neutral silver chloride concentrations decrease, and silver desorbs except when associated with phytoplankton, where it is tightly bound to cell membranes. Silver bioavailability is usually related to the free silver ion, but neutral silver chloride may be the most bioavailable form of silver in the open ocean or at low free silver ion concentrations in freshwater (WHO 2002). Silver from sediments containing silver sulfide does not appear to appreciably enter the aquatic food web (WHO 2002).

In freshwater, aquatic insects concentrate silver in proportion to exposure concentrations and appear to be more efficient concentrators than fish (WHO 2002). Freshwater and marine fish have been found to also accumulate silver in direct proportion to ionic silver concentrations and over time, primarily in the liver and gut in teleosts and in the gills in elasmobrachs (WHO 2002). However, bioconcentration factors (BCFs) for silver tend to be inversely proportional to the exposure concentration (McGreer et al. 2003). Biomagnification of silver in aquatic food chains is considered unlikely (ATSDR 1990; WHO 2002). Accumulation data for terrestrial wildlife appear to be sparse. In caribou, wet weight BCFs were reported to be the highest BCF in the liver, followed by bone, kidney, and muscle (Eisler 1996).

19.4 Toxicity

Silver is toxic to bacteria and soil microorganisms (ATSDR 1990), and dissolved ionic silver is particularly toxic to aquatic organisms (Eisler 1996). Dissolved ionic silver is more toxic by at least an order of magnitude than sorbed and complexed silver, which are expected to be prevalent in natural waters (WHO 2002). The toxicity of silver ion in freshwater can be reduced by lower silver ion concentrations and higher water pH, hardness, salinity, sulfides, particulate organic matter, and especially dissolved organic carbon.

Symptoms of stress induced by silver exposure may vary widely among aquatic taxa; for example, increased oxygen consumption has been observed in bivalve mollusks, while respiratory distress has been observed in marine gastropods and fish (Eisler 1996). Increased tolerance to silver has been observed in algae in small lakes containing higher concentrations of copper, nickel, or other metals (Eisler 1996). In freshwater fish, acute toxicity of silver is caused by the inhibition of osmoregulation at the gills by silver ion (WHO 2002). Exposure to ionic silver may result in muscle deterioration in frogs due to interference with calcium metabolism (Eisler 1996).

In birds and mammals, chronic exposure to silver ions results in cardiac enlargement, hypertension, anemia, liver necrosis and kidney damage, lowered immunological activity, altered membrane permeability and enzyme inhibition, reduced growth, and reduced life span (Eisler 1996). Toxicity data for avian species consist mainly of studies conducted in domestic chickens, turkeys, or mallard ducks. Adverse effects on the heart, hematology, liver, growth, and survival have been observed in young turkeys exposed via diet or drinking water, which were observed at lower doses when copper or vitamin E were deficient (Eisler 1996). Silver has no known function in mammals, is not well absorbed after oral administration, and is mostly eliminated in feces. It may act antagonistically with selenium, copper, and vitamin E (Eisler 1996; WHO 2002). Absorption is dependent mostly on transit time through the gastrointestinal tract (Eisler 1996). Silver can be retained in all tissues and accumulates with age (Eisler 1996); the highest concentrations are usually found in the liver and spleen, followed by the muscles, skin, and brain (Eisler 1996). Silver has not been shown to be mutagenic, carcinogenic, or teratogenic by common routes of exposure such as dietary exposure (Eisler 1996). Silver nitrate has been shown to be less toxicity than silver cyanide or silver arsenate (Eisler 1996).

20. Strontium

20.1 Overview

Strontium is an alkaline earth element that occurs naturally in the earth's crust only in combination with other elements. In the United States, most strontium is used to manufacture ceramics and glass products, such as faceplate glass for televisions. Most commercial strontium is fed into processes as strontium carbonate. Other strontium compounds may also be used in products such as pyrotechnics, paint pigments, and fluorescent lights. Metallic strontium is used infrequently as an alloy (ATSDR 2004).

Strontium occurs widely in the oceans and in the earth's crust. Strontium and its compounds are released to the environment from both natural and anthropogenic sources; however, contributions to the atmosphere result primarily from natural sources such as wind-driven soil resuspension, dust particle entrainment, and ocean spray (ATSDR 2004). Strontium is also released to surface water and groundwater via natural weathering of rocks and soils. Anthropogenic releases of strontium result from processing of strontium compounds, combustion of coal, land application of phosphate fertilizers, use of pyrotechnics, disposal of solid waste, and direct wastewater discharge (ATSDR 2004).

20.2 Environmental Fate and Transport

Strontium occurs in three oxidation states, 0, +I, and +II; the latter is highly reactive with water and oxygen and is the most stable and important form in the natural environment. Four stable isotopes of strontium occur naturally: ^{84}Sr, ^{86}Sr, ^{87}Sr, and ^{88}Sr (ATSDR 2004).

Strontium exists primarily as a strongly hydrated cation (simplistically represented as Sr^{+2} or $SrOH^{+}$) in surface water and groundwater and is also found as an ionic solution complex or an ionic salt. The solubility of strontium compounds varies; some strontium compounds, such as strontium chloride or strontium nitrate, are more soluble in water, while others, such as strontium carbonate and strontium sulfate, are almost insoluble in neutral water (ATSDR 2004). The ocean is the largest reservoir of dissolved strontium; the dissolved strontium is then deposited in marine carbonate sediments (ATSDR 2004).

Sorption of Sr^{+2} to soil and sediments varies widely (ATSDR 2004). Strontium is moderately mobile in soils and sediments, sorbing moderately to metal oxides, weathered minerals, and clays (ATSDR 2004). Strontium is less likely to be mobile if it precipitates as strontium carbonate at higher concentrations (ATSDR 2004). Mobility through soil to groundwater is also affected strongly by the concentrations of organic matter in soil, which can result in precipitation of strontium-organic matter complexes. This process is enhanced by high concentrations of ion exchangeable Ca^{+2} and can be inhibited by nitrate fertilizers (ATSDR 2004). However, high salt concentrations and competition for sorption sites in sediments from Ca^{+2} and Mg^{+2} have been shown to increase the mobility of strontium in water (ATSDR 2004).

20.3 Uptake and Bioaccumulation

Strontium is not considered an essential nutrient for plants, but is easily taken up from soil by plants (soil to plant concentration ratios of 0.017-1.0) through the calcium uptake pathway (ATSDR 2004). Strontium uptake is greatest in sandy soils with low concentrations of clay and organic matter (ATSDR 2004) and lower in soils with higher concentrations of calcium and other essential nutrients (ATSDR 2004). Accumulation of strontium is higher in the most metabolically active parts of a plant, although translocation varies according to species and growth stage (ATSDR 2004). Strontium can also be absorbed directly through leaves after atmospheric deposition and then be retained in there (ATSDR 2004).

Strontium cycling in food chains has been studied primarily in radioactive ^{90}Sr. After strontium is translocated to the aboveground parts of plants, it can be released to soil via leaf fall and recycled in plants or transported within soil and to other locations in animal tissue or feces and by the action of burrowing organisms, which can also allow water infiltration (ATSDR 2004).

Strontium is required for the normal development of a variety of aquatic organisms in connection with skeletal materials. These include protozoa (Acantharia, Radiolaria), calcareous algae (Halimeda), gastropods, bivalves, and cephalopods (WHO 2010). Strontium is also incorporated into the aragonite (a form of $CaCO_3$) of reef-building corals in relatively high concentrations (WHO 2010). Studies on squid axons have shown that treatment of strontium is similar to calcium (WHO 2010), and strontium is regulated in linkage with magnesium in giant Malaysian freshwater prawns (WHO 2010). Strontium accumulation in anuran frogs may differ among species, but increases with each developmental stage, suggesting that strontium partitions to tissues such as bone that are retained through metamorphosis (Roe et al. 2005). In terrestrial environments, earthworms have been observed to accumulate strontium in acidic, calcium-poor soils but not in calcium-rich soils (WHO 2010).

BCFs calculated for ^{90}Sr indicate that uptake is highest in aquatic organisms such as algae, zooplankton, molluscs, macrophytes, macroinvertebrates, and fish. The similar chemical and metabolic behavior of strontium and calcium appears to particularly influence bioaccumulation in fish. Very high BCFs were calculated in fish bone and were highest in piscivores, followed by benthic invertebrate and fish feeders, detritus and plankton feeders, and insect and bottom invertebrate feeders. In addition, the bioaccumulation of strontium in fish was inversely correlated to concentrations of calcium in water, a correlation that did not apply to other organisms such as plants and algae (ATSDR 2004).

Snakes fed fish containing strontium accumulated strontium in the gonads, kidney, and liver. Strontium accumulations in these snakes were significantly higher than accumulations in control snakes overall but not in specific organs (Hopkins et al. 2001). Juvenile snakes fed these fish over a longer period accumulated more strontium; accumulations were higher in the kidney and gonads than in the liver, particularly in the kidney in males, and were directly related to the number of contaminated meals ingested (Hopkins et al.

2002). A study in toads suggests that the percentage of strontium transfer to eggs is lower and more variable than other elements such as selenium and may be asymptotic, with females with higher preovipositional body burdens transferring proportionally less strontium to eggs than reference females (Hopkins et al. 2006).

20.4 Toxicity

Toxicity tests show low acute toxicity of strontium to freshwater invertebrates (WHO 2010). Marine data suggest lower toxicity of strontium to marine invertebrates than freshwater invertebrates but are difficult to interpret. The wide range of background concentrations in natural water introduces substantial uncertainty to this value.

In embryo-larval tests in fish and amphibians, the narrow-mouthed toad was the most sensitive species tested (Birge et al. 1978). Strontium levels reported in the tissues of amphibians exposed to coal combustion waste have not been firmly linked to observed reproductive and developmental effects (Hopkins et al. 2006).

Toxicity studies on mammals have focused on rats and mice. Strontium administered as a chloride, carbonate, sulfate, or nitrate salts showed low acute oral and dermal toxicity to these animals. Effects have been noted on the thyroid, liver, and pituitary gland (WHO 2010). For repeated oral exposure, bone appears to be a primary target tissue (WHO 2010). Limited available data have not shown strontium to be carcinogenic, genotoxic, mutagenic, or reproductively toxic, except for some indication of adverse effects on bone in young animals (WHO 2010). Soluble stable strontium compounds have low acute toxicity (USEPA 1988). Unstable strontium-90 isotope was found to cause death from radiation-induced hemorrhagic syndrome in swine in high doses. No studies examining the effect of strontium (stable or unstable) fed to avian species were found.

21. Thallium

21.1 Overview

Thallium is a heavy metal that occurs naturally as a trace element in the earth's crust either alone or, more frequently, combined with other metals, oxygen, sulfur, or halides. Thallium can be recovered from flue dust and other residuals of lead, zinc, and copper smelting (ATSDR 1992). Thallium and its compounds are used for a variety of purposes, including in the semiconductor industry, cardiac imaging, glass and optical systems, specialized thermometers, photoelectric cells, ore separation, chlorination catalysis, maritime signaling, artificial gem production, and other chemical processes (ATSDR 1992). Thallium use as a pesticide was banned in the United States in 1972 (ATSDR 1992).

Thallium is widely distributed in environmental media as a trace element. Natural releases of thallium can result from the weathering of crustal rocks (IPCS 1996). Anthropogenic releases of thallium to air, water, and soil result less from production and use of thallium compounds and more from coal combustion, cement manufacturing, smelting, and other refining and processing industries using raw materials containing trace amounts of thallium (ATSDR 1992).

21.2 Environmental Fate and Transport

Thallium occurs in three oxidation states, 0, +I, and +III; the +I state is most common and stable in the natural environment. Fly dust emitted from a cement plant was primarily thallium(+I) chloride (IPCS 1996). Thallium may be associated with fine airborne particulates (ATSDR 1992) and sorb to soils and sediments (ATSDR 1992). Thallium tends to be retained in soil during the weathering of rocks (IPCS 1996). After atmospheric deposition, thallium tends to accumulate in surface soil, and greater retention is expected in soils with higher concentrations of clay, organic matter, and iron/manganese oxides; however, greater leaching is expected under acidic conditions (IPCS 1996). Thallium can also be removed from solution in soils by ion exchange or incorporated into weathering-resistant humus complexes (IPCS 1996). Thallium can be released from trees, which are potential long-term reservoirs, to soil and other plants via bark mulching (IPCS 1996). Some anaerobic microorganisms may be able to methylate thallium (IPCS 1996).

Thallium compounds are typically very water soluble. In freshwater, dissolved Tl^{+} is expected to dominate, while dissolved Tl^{+3} may dominate in saltwater or highly oxidizing freshwater (IPCS 1996). Although both forms can be removed from solution by undergoing various exchange and complexing reactions with suspended solids, Tl^{+3} is particularly susceptible to precipitation by hydrolyzing and precipitating as thallium(+III) hydroxide over the pH range of natural water and potentially reducing to thallium(+I) and then precipitating as thallium sulfide in anaerobic, highly organic sediment (IPCS 1996). One short-term experiment that studied partitioning of thallium(+I) nitrate added to water among submerged aquatic

vegetation, goldfish, and washed sand suggested that exchange between sediment and other compartments was low but that thallium accumulated in vegetation and fish (IPCS 1996).

21.3 Uptake and Bioaccumulation

The bioavailability of thallium compounds to terrestrial plants from soil depends generally on the solubility of the individual compounds (IPCS 1996), which can vary from very soluble to insoluble (ATSDR 1992). Availability has been found to be greater in acidic soils and from soils and sediments contaminated with cement plant dust (e.g., thallium[+I] chloride or iodide) compared to mining waste or uncontaminated material (IPCS 1996).

Uptake of Tl^{+} ions may occur in all parts of a plant via the potassium uptake pathway, such that thallium absorption is regulated metabolically and can be non-competitively inhibited by potassium (IPCS 1996). Fine thallium-containing particles cannot be absorbed via transpiration through stomata (IPCS 1996), and uptake of fly dust through sunflower leaves was minimal (IPCS 1996). Tl^{+3} uptake may be lower than Ti^{+} uptake and does not appear to be regulated by the same processes (IPCS 1996).

BCFs for plants grown in soils with high thallium concentrations can be highly species dependent (IPCS 1996). In green plants, thallium tends to accumulate in chlorophyll-containing structures such as the leaves, although some plant species may accumulate more in roots (IPCS 1996).

Accumulation of thallium from feed may occur in farm animals. In broiler hens, uptake was highest in the kidney, bone, and muscle, whereas for laying hens uptake was highest in egg shells, kidney, bone, and egg yolk (IPCS 1996). Thallium may be bioconcentrated in aquatic plants, invertebrates, and fish. Despite its potential for bioconcentration, thallium is unlikely to biomagnify in terrestrial or aquatic food webs (IPCS 1996).

21.4 Toxicity

Adverse effects of thallium on plants include direct cytotoxicity, often indicated by chlorosis; inhibition of photosynthesis; and decreased productivity. Detailed effects and toxicity data are summarized further in IPCS (1996). These effects may be caused by disturbance to the uptake of trace elements or an imbalance in cellular cations (IPCS 1996). Thallium effects photosynthesis and pigments in plants (IPCS 1996). Growth parameters in duckweed, including weight, frond number, and frond area are also effected at various concentrations (IPCS 1996).

Aquatic invertebrates are generally more sensitive to thallium than fish. Adverse effects of thallium on fish can include uncoordinated movement, disturbed balance, gill paralysis, effects on respiration, and other behavioral alterations that indicate nervous system damage (IPCS 1996). Different species sensitivities are

evident. In embryo-larval tests in fish and amphibians the narrow-mouth toad was the most sensitive species tested (Birge et al. 1978). Another study suggested that absorption of thallium by frog eggs was minimal and did not affect development at various levels, although all tadpoles were killed at hatching (IPCS 1996).

The toxicity of thallium is well-known from its use as a rodenticide (and its subsequent negative effects on domestic animals and wildlife). However, few studies on oral toxicity have been performed on birds. Thallium toxicity has been observed in birds that consume thallium-poisoned baits or that prey on rodents consuming corn and other crops poisoned with thallium pesticides. Effects in ducks, geese, and quail receiving thallium in feed included congestion and damage to the respiratory system, intestines, and liver (IPCS 1996). Gizzard erosion and reductions in body weight, laying rate, feed efficiency, and eggshell thickness were observed in chickens fed feed containing thallium (IPCS 1996).

In mammals, thallium is rapidly absorbed via oral, dermal, and inhalation routes and distributed to all organs. In acute poisonings, higher concentrations appear in kidneys and lower concentrations in fat and brain, which may increase later. The biological half-life of thallium is fairly short and ranges from 3 to 8 days in laboratory animals (IPCS 1996).

Symptoms of acute and chronic intoxication are similar and include anorexia, vomiting, depression, diarrhea, skin changes, shortness of breath, nervous disorders, hair loss, and respiratory failure. Cell damage occurs particularly in the kidneys, liver, intestines, heart, and nervous system, and sexual activity may be reduced after chronic exposure. Clear and consistent teratogenic, mutagenic, or carcinogenic effects of thallium have not been found (IPCS 1996).

Similar to birds, thallium toxicity has been observed in small mammals that consume thallium-poisoned baits or poisoned prey. In thallium poisoned animals, abnormal behaviors including uncoordinated movements, loss of balance, and an empty stomach in foxes have been observed (IPCS 1996).

22. Vanadium

22.1 Overview

Vanadium is a relatively abundant and widely distributed metal that occurs naturally in the earth's crust at average concentrations similar to zinc and nickel and only in combination with other elements (ATSDR 2009). Vanadium for human use can be mined from deposits containing other materials of interest, such as phosphate, titanium, iron, copper, lead, zinc, uranium, and petroleum (ATSDR 2009). The processing of petroleum residues, spent catalysts, utility ash, and pig iron slag can also yield vanadium to produce vanadium metal, vanadium pentoxide, ferrovanadium, and other alloys and chemicals for industry (ATSDR 2009). Most vanadium in the United States is used as a stabilizing, bonding, and alloying agent for iron and steel, especially as ferrovanadium, to produce rust-resistant, spring, and high-speed tool steels. Vanadium pentoxide is used as a catalyst, in ceramics, and to produce superconductive magnets (ATSDR 2009). Elemental vanadium, vanadyl sulfate, and sodium metavanadate have also been used in nutritional supplements (ATSDR 2009).

Vanadium is released to the environment from both natural and anthropogenic sources; however, natural releases to soil and water are greater than anthropogenic releases to the atmosphere or other media. Natural releases of vanadium to the atmosphere result primarily from dust and ocean spray, followed by volcanic emissions (ATSDR 2009). Natural releases to soil and water result primarily from rock weathering and soil erosion (ATSDR 2009). Since vanadium is a constituent of almost all coal and petroleum crude oils, anthropogenic releases to the atmosphere result primarily from the combustion of fossil fuels. Residual fuel oils are the greatest source, while distillate fuel oils and natural gas are not expected to be significant sources to the environment except during large spills (ATSDR 2009). Anthropogenic releases to water, sediments, and soil can also occur from manufacturing and processing facilities and from leaching from mine tailings, slag heaps, sewage sludge, and fertilizers (ATSDR 2009).

22.2 Environmental Fate and Transport

Vanadium can occur in oxidation states ranging from -I to +V; however, only the +III, +IV, and, most frequently, +V forms occur naturally (ATSDR 2009). As for many inorganics, the solubility of vanadium compounds ranges from soluble to insoluble in water (ATSDR 2009). Vanadium compounds released to the atmosphere from anthropogenic sources are typically vanadium oxides (ATSDR 2009), while vanadium that weathers naturally may typically be less-soluble trivalent vanadium contained in mineral particulates (ATSDR 2009). This trivalent vanadium generally oxidizes to more-soluble pentavalent vanadium in water, except in very reducing environments or if it is complexed to organic ligands (ATSDR 2009).

Vanadium in freshwater is transported primarily in suspension by adsorption or complexing with mineral and biogenic materials. However, vanadium can also be transported in solution as vanadyl (V^{+4}, commonly VO^{+2}

or $VO(OH)^+$) ions in reducing conditions or vanadate (V^{+5}, commonly $H_2VO_4^-$ or HVO_4^{-2}) ions in oxidizing conditions (ATSDR 2009). In saltwater, suspended vanadium is deposited in sediment, and dissolved vanadium (commonly $H_2V_4O_{13}^{-4}$, HVO_4^{-2}, or VO_4^{-3}) is almost completely removed from solution by adsorption to organic matter, manganese oxide, and ferric hydroxide or by uptake into marine organisms and deposition in sediment after death (ATSDR 2009).

Vanadium is fairly mobile in neutral or alkaline soil and under oxidizing or unsaturated conditions; however, it can be less mobile or immobile in acidic soil or under reducing or saturated conditions (ATSDR 2009). Pentavalent vanadium is most easily leached from soil to water. As in saltwater, organic particles such as bitumens and iron particles such as ferric hydroxide can act as carriers for vanadium (ATSDR 2009). Vanadium can undergo a number of complex chemical reactions with inorganic and organic agents in soil, such as immobilization in the presence of humic acids by conversion of metavanadate anions (VO_3^-) to vanadyl cations (ATSDR 2009).

22.3 Uptake and Bioaccumulation

Vanadium may be an essential trace element for mammals; interacts with enzymes and other molecules in some marine organisms; and is a component of (or can substitute for molybdenum in) some nitrogen fixation systems (WHO 2001).

Uptake of vanadium into terrestrial plants from soil depends on pH, concentrations of water-soluble vanadium in soil, and growing conditions. Concentrations of vanadium in roots are more likely to correlate with concentrations in soil than concentrations in above-ground plant parts, which are usually low. Bioconcentration occurs less often in seed plants than in lower taxa, but some legumes accumulate vanadium in root nodules (ATSDR 2009). A study of vanadium leaching and bioavailability to bean plants suggested that leaching was low and that availability decreased over time due to binding of vanadium within soil (WHO 2001). Vanadium likely occurs in all terrestrial animals, but concentrations may be below the detection limit in many vertebrates, (ATSDR 2009). In mammals, vanadium concentrations are typically highest in liver and bone (ATSDR 2009).

Marine organisms typically contain more vanadium than terrestrial organisms. Marine ascidians (sea squirts) are particularly effective at bioconcentrating vanadium and have been found with body concentrations at 10,000 to10,000,000 times that of ambient seawater (WHO 2001; ATSDR 2009). Polychaetes of the genus *Pseudopotamilla* may also be vanadium accumulators (WHO 2001).

Accumulation of vanadium in marine organisms may occur primarily from food (WHO 2001). Despite the ability of some organisms to bioconcentrate vanadium, biomagnification within food chains is generally considered unlikely (WHO 2001; ATSDR 2009). Vanadium measured in marine mammals showed a correlation with age (WHO 2001).

Snakes fed fish containing vanadium accumulated vanadium in the gonads, kidney, or liver. Vanadium accumulations in these snakes were significantly higher than accumulations in control snakes overall, but not in specific organs (Hopkins et al. 2001). Juvenile snakes fed these fish over a longer period accumulated somewhat more vanadium, and accumulations were highest in the liver, with lower accumulation in the kidneys and no significant accumulation in the gonads; however, there were age- and sex-specific differences, with accumulation higher in the kidney (particularly females) and gonads (particularly males) in juveniles than in adults (Hopkins et al. 2002). A study in toads suggests that while females accumulate vanadium, transfer to eggs is low (Hopkins et al. 2006).

22.4 Toxicity

Depending on species, soil type, and form of vanadium, plants may exhibit toxic effects from vanadium (WHO 2001). Tests conducted in hydroponic conditions have found that vanadium may induce iron deficiency chlorosis and affect trace element nutrition and growth in plants; however, legumes may be more tolerant of vanadium due to its connections to nitrogen fixation (WHO 2001). Vanadium is not considered essential to plants; however, vanadium was found to stimulate algal growth at low levels (IPCS 1988). Effects on cell division and lethal effects were found in a freshwater alga at some concentrations (IPCS 1988).

Some studies suggest that smaller fish and mammals may be more tolerant of vanadium exposure than larger animals (IPCS 1988). The toxicity of vanadium to freshwater fish is influenced by water hardness and pH, with evidence that acute toxicity is higher in hard water and at neutral pH (IPCS 1988).

Vanadium levels reported in the tissues of amphibians exposed to coal combustion waste have not been firmly linked to observed reproductive and developmental effects (Hopkins et al. 2006; Roe et al. 2006). No toxicity data were identified for reptile species, but vanadium levels in reptile tissue have been reported in several studies (Hopkins et al. 2001 and 2002). These studies suggest that relatively high exposures may be needed to induce significant effects in aquatic snakes, although reproductive endpoints have not been assessed.

Rattner et al. (2006) evaluated the potential impacts of single oral doses of vanadium pentoxide and sodium metavanadate to mallard ducks. Vanadium accumulated in the liver and kidneys in proportion to dose. Based on the body burden data for these acutely exposed ducks, Rattner et al. (2006) suggested vanadium burdens associated with mortality by sodium metavanadate exposure. The most common lesion observed was intestinal inflammation and hemorrhaging, sometimes accompanied by damage to the heart, liver, or kidneys depending on species (duck or goose) and form of vanadium.

Studies of oral exposure suggest that vanadium is not well absorbed via the mammalian gastrointestinal tract and is distributed primarily to the bone, liver, and kidney (WHO 2001). Data from laboratory animals

suggest that the gastrointestinal and hematological systems are sensitive targets following oral exposure to vanadium compounds (ATSDR 2009). Pentavalent vanadium may be the most toxic form (IPCS 1988), and some forms may be able to induce genotoxic effects (WHO 2001). Reproductive and developmental effects are possible, but there is evidence of potential confounding effects of general toxicity (ATSDR 2009; WHO 2001).

23. Zinc

23.1 Overview

Zinc is a naturally-occurring element found in the earth's crust. It is found in the air, soil, and water and is present in all foods. Metallic zinc has many uses in industry, including coating steel, iron and other metals to prevent rust and corrosion (i.e., galvanization). It is also mixed with other metals to form alloys such as brass and bronze. Zinc metal dust is widely used in paint coatings, as a catalyst, and as a reducing and precipitating agent in organic and analytical chemistry.

Zinc is released to the environment from both natural and anthropogenic sources; however, releases from anthropogenic sources are generally greater. Natural emissions of zinc and its compounds are mainly due to windborne soil particles, volcanic emissions and forest fires. Primary anthropogenic sources are related to mining and metallurgic operations and use of commercial products containing zinc. Zinc is released into the environment as the result of mining, smelting of zinc, lead and cadmium ores, steel production, coal burning and burning of waste. The most important sources of anthropogenic zinc in soil come from discharges of smelter slags and wastes, mine tailings, coal and bottom fly ash, and the use of commercial products such as fertilizers and wood preservatives that contain zinc. The largest input to water is from erosion of soil particles containing natural traces of zinc, however, urban runoff, mine drainage, and municipal and industrial effluents provide smaller but more concentrated inputs. Metal manufacturing, publicly-owned treatment works, and atmospheric fallout are other sources to water. Industries that discharge large quantities of zinc directly to water include iron and steel, zinc smelting, plastics, and electroplating (ATSDR 2005).

23.2 Environmental Fate

Zinc is one of the most ubiquitous and mobile of the heavy metals and occurs in the environment mainly in the +II oxidation state (ATSDR 2005), although it also has oxidations states of 0 and +I. Sorption is the dominant reaction, resulting in the enrichment of zinc in suspended and bed sediments (ATSDR 2005). Zinc in aerobic waters is partitioned into sediments through sorption onto hydrous iron and manganese oxides, clay minerals, and organic material.

Zinc is transported in natural waters in both dissolved forms and associated with suspended particles (ATSDR 2005). In water, zinc occurs primarily in the +II oxidative state and is predominantly present in the dissolved form. It dissolves in acids to form the hydrated cations (simplistically represented as Zn^{+2}) and in strong base to form zincate anions (e.g., $(Zn[OH]_3)^-$, $(Zn[OH]_4)^{-2}$, and $(Zn[OH]4[H_2O]_2)^{-2}$). However, at the pH of most natural waters, the formation of anionic zinc species is not likely. In most waters, zinc exists primarily as Zn^{+2} or complexes with dissolved organic matter. A small part of the available zinc may partition into the aquatic phase through the formation of soluble zinc chloride and sulfate compounds. Changes in pH

can affect the amount of zinc that dissolves, however, because of the buffering action of most natural waters, the solubility of zinc carbonate and hydroxide typically controls the availability of zinc. It often forms complexes with a variety of organic and inorganic ligands. In low salinity areas of estuaries, zinc can be mobilized from particles by microbial degradation of organic matter and displacement by calcium and magnesium. In a turbid environment, zinc associated with suspended sediment will be deposited with flocculated particles where it can accumulate particularly in anaerobic sediments.

Zinc content in sediment is closely correlated with the depth, organic content, and clay content of the sediments. The tendency to sorb is affected by pH, with zinc absorbing more readily at high pH than low pH. In addition, Eh, the concentration of zinc ions and other ions in the soil porewater, the number and type of adsorption sites associated with the solid phase, and the organic ligands present that are capable of forming complexes control the precipitation/dissolution, complexation/dissociation and adsorption/desorption that occurs. Zinc does not volatilize from soil, however it can leach (ATSDR 2005).

23.3 Uptake and Bioaccumulation

Zinc is taken up directly from the water by both leaves and stems by the aquatic species *Potamogeton natans* (Fritioff and Greger 2006). Zinc bioconcentrates moderately in some aquatic organisms; bioconcentration is higher in crustaceans and bivalve species than in fish. Zinc does not concentrate in plants, and it does not biomagnify through terrestrial food chains (ATSDR 2005).

In some fish, the zinc concentration found in their bodies does not directly relate to the exposure concentrations. Instead the bioconcentration factor is inversely related to the aqueous exposure concentration (McGeer et al. 2003). This evidence suggests that fish placed in environments with lower zinc concentrations can sequester zinc in their bodies.

In the case of zinc, the BCF is not useful for relating uptake to adverse effects, because it does not consider physiological parameters (WHO 2001). The fact that zinc, as an essential metal, is naturally concentrated by living organisms means that the BCF for zinc bears no relationship to toxicity (WHO 2001). Bioaccumulation does not differentiate between zinc adsorbed to the outer surface of organisms, and the zinc within organisms. Rapid bio-inactivation of zinc, for instance compartmentation into vacuoles, may result in elevated BCFs with no difference in the health of the organism (WHO 2001). Additionally, the fact that many organisms are capable of regulating internal zinc concentrations within certain limits means that these organisms can stabilize internal concentrations against perturbations or high concentrations in the external environment (WHO 2001). Therefore, whole-body zinc concentrations do not necessarily reflect ambient concentrations. In contrast to lipophilic organic compounds, zinc BCFs cannot be considered to be constant ratios between tissue concentrations and external water concentrations (WHO 2001).

23.4 Toxicity

Effects of excess zinc on natural resources are modified by numerous variables, especially by interactions with other chemicals. Interactions frequently produce radically altered patterns of accumulation, metabolism, and toxicity some of which are beneficial to the organism whereas others are harmful (Eisler 1993).

Zinc is an essential trace element for higher plants. In higher plants, zinc is absorbed as the divalent cation (Zn^{+2}) which is a metal component of enzymes or a functional, structural, or regulatory cofactor of a large number of enzymes. Zinc has been shown to have toxic responses for several sensitive plant species including lethality and inhibited photosynthesis. Significant adverse effects of zinc on growth, survival, and reproduction can occur in representative sensitive species of aquatic plants at high enough concentrations (Eisler 1993). Zinc has been reported to have an indirect effect on biomass of river periphyton, especially in areas where primary production is phosphorous limited. (Paulsson et al. 2000). In a controlled mesocosm experiment, low concentrations of zinc altered the algal species composition, with communities dominated by green and blue-green algae (Genter et al. 1987).

Concentrations of zinc in tissues of aquatic invertebrates are usually far in excess of that required for normal metabolism (Eisler 1993). Much of the excess zinc is bound to macromolecules or present as insoluble metal inclusions in tissues (Eisler 1993). Elevated concentrations of zinc have been associated with behavioral effects, low species richness, and elevated mortality. However, effects are generally not observed until concentrations are quite high.

Signs of zinc poisoning in fish included hyperactivity followed by sluggishness before death. Fish swam at the surface, were lethargic and uncoordinated, showed hemorrhaging at gills and base of fins, shed scales, and had extensive body and gill mucous (Eisler 1993). Amphibian embryos have been shown to be more sensitive to zinc than older stages (Eisler 1993).

Zinc excess in avian species is associated with decreased body weight, gizzard and pancreatic lesions, and biochemical changes (USEPA 2007). Toxicity studies on avian species have focused primarily on domesticated species of chicken, with studies of Japanese quail and mallard duck also found to a lesser degree. Studies have quantified biochemical, behavioral, physiological, pathological, reproduction, growth, and survival effects.

In mammals, excess zinc is associated with vomiting, depressed growth rate, purgation, and ataxia (USEPA 2007). Absorption of zinc occurs from all segments of the intestine. Following absorption, zinc is rapidly distributed to the liver, kidneys, prostate, muscles, bones, and pancreas. Zinc salts adversely affect tissues, interfere with the metabolism of other ions such as copper, calcium, and iron, and inhibit erythrocyte production and function (ATSDR 2005; USEPA 2007).

Toxicity studies on mammalian species have focused primarily on domesticated species of livestock and laboratory rats, with studies of mink also found to a lesser degree. Studies have quantified biochemical, behavioral, physiological, pathological, reproduction, growth, and survival effects.

24. Silica

24.1 Overview

Silica, or silicon dioxide (SiO_2), is a ubiquitous compound that occurs naturally in both crystalline and amorphous forms. Most crystalline silica is quartz or sand, and amorphous silica may occur naturally in plants and in sediments or rocks formed from the siliceous cell walls of dead aquatic organisms such as diatoms. A number of silicate compounds containing other elements such as sodium, potassium, calcium, magnesium, iron, or aluminum also occur widely in nature (USEPA 1996). Both crystalline and amorphous silica can also be synthesized.

Silicon dioxide dust, derived from diatomaceous earth, has been used as a pesticide for indoor and outdoor control of insects, mites, and ticks on food and pets (USEPA 1991). Synthetic amorphous silica (SAS) can be used in the same manner (OECD 2004; USEPA 1991). Crystalline silica is used in a vast array of industrial and consumer applications, including glass, ceramics, and china; construction materials; foundry molds; fracture water; water filters; jewelry; electronics; and many more (USGS 1992). SAS, synthetic amorphous sodium aluminum silicate, and synthetic amorphous calcium silicate are also used in a variety of industrial and consumer applications as thickeners, powder flow enhancers, and fragrance or flavor carriers in cosmetics, pharmaceuticals, and foods; and in animal feed, rubbers, silicones, paints, lacquers, plastics, and paper (OECD 2004).

Silica can be released to the environment from virtually any natural or anthropogenic activity that disturbs rocks, soils, or sediments. Natural releases to the environment include forest fires, volcanic eruptions, and wind erosion or other weathering. Anthropogenic releases to the environment include particulate emissions associated with construction or demolition; dust from unpaved roads; ceramic, brick, and clay industries; metallurgy; quarrying and mining; agriculture; and power plants, including coal-burning facilities (USEPA 1996). Silica is also released to other environmental media by mining, farming, construction, founding, and other processes (WHO 2000). Anthropogenic SAS released to the aquatic environment is estimated to be a small percentage of the amount of naturally dissolved silica in rivers (OECD 2004).

24.2 Environmental Fate and Transport

Silicon exists in nine oxidation states: -IV, -III, -II, -I, 0, +I, +II, +III, and +IV; however, it usually is only in the +IV oxidation state in natural waters. Because the silicon-oxygen bond is highly stable, silica is unlikely to react chemically with other environmental substances (except for ion exchange, dissolution, and sedimentation) or to photo, bio, or chemically degrade (OECD 2004; USEPA 1991). Silica is not very soluble in water, not volatile, and not lipophilic (OECD 2004; USEPA 1996). In the environment, silica is expected to partition primarily to soils or sediments, where anthropogenic silica is virtually indistinguishable from natural inorganic silica. Surface waters are a large reservoir for the relatively small fraction of silica that is dissolved

in water as silicic acid ($Si[OH]_4$), which can be taken up into the structural framework of freshwater and marine diatoms and some marine organisms such as radiolarians and sponges. Silicon returns to sediments when those organisms die (OECD 2004).

24.3 Uptake and Bioaccumulation

Dissolved silica is bioavailable to aquatic plants and invertebrates and can be used in the structural framework of freshwater and marine diatoms and some marine organisms such as radiolarians and sponges (OECD 2004). Elemental silicon, taken up as silicic acid, is considered essential for members of the Equisetaceae family (horsetails, a type of vascular plant) (Epstein 1999). However, the biological role of silicon in most other organisms is not well understood. Silicon is present in plants at high concentrations (Epstein 1999), and there is some indication that it may play a large role in plant nutrition (Epstein 1994 and 1999). Silicon may also be needed for normal metabolism in connective tissue and bone in chicks and rats (Nielsen 1984 and 1991). Despite silicon's potential role as a trace nutrient, intestinal absorption of silica has been found to be insignificant in rodents, resulting in excretion in the feces (95 percent), and most bioavailable silica appears to be readily eliminated via the kidneys (4 percent) (OECD 2004; USEPA 1996).

Silica does not appear to be very bioaccumulative in mammals. For example, although daily oral administration of 1,500 mg/kg body weight SAS in aqueous suspension for 1 month resulted in silicon dioxide concentrations in the liver, kidney, and spleen of rats that were higher on average in control animals, 20 daily oral doses of 100 milligrams SAS (approximately 500 mg/kg body weight) resulted in silicon dioxide concentrations that were only slightly elevated in the liver and kidney compared to control animals (OECD 2004).

24.4 Toxicity

The vast majority of literature regarding the toxicity of silica addresses inhalation hazards to laboratory animals or humans posed by airborne particulates in ambient air and occupational settings, especially crystalline silica. Birds and terrestrial mammals, such as horses and camels, which have been exposed to ambient crystalline silica as quartz in deserts and coastal areas have shown some pathology that is similar to silicosis, a progressive lung disease that may result in lung cancer in humans (WHO 2000). However, this exposure pathway is unlikely to be relevant for an ecological evaluation that focuses primarily on aquatic exposures to silica. Therefore, no toxicity data for silica exposures to birds and mammals are included in Appendices E and F.

Generally, toxicity data for silica indicate that it is inert when ingested and unlikely to pose risks to biota except through physical mechanisms. For example, silicon dioxide dust and SAS act as desiccants on insects by removing the oily protective film on their bodies (OECD 2004; USEPA 1991). However, chronic toxicity is not expected for SAS and related compounds due to the lack of acute toxicity and ubiquity of silica

and silicates in the environment. Data requirements under the Pesticide Registration Program for environmental fate and ecological effects were waived for silica in USEPA (1991) due to its ubiquity and lack of chemical reactivity. Various forms of silica and silicates have been considered “Generally Regarded as Safe” by the U.S. Food and Drug Administration (1979), and WHO (1974) found no grounds to limit daily intakes of silica or silicate compounds. The available data regarding silica exposures to aquatic species focus on silicic acid and therefore may provide an overly conservative estimate of the actual toxicity of solid silica in the river system.

25. Polycyclic Aromatic Hydrocarbons (PAHs)

25.1 Overview

PAH are a large group of chlorinated organic chemicals composed of two or more fused benzene rings (USEPA 2003). PAHs in the environment originate primarily from two sources, petrogenic (i.e., petroleum sources including different types of oils, coals and organic shales) and pyrogenic (i.e., combustion). The majority are associated with pyrogenic sources. Petrogenic PAHs are usually associated with local or point sources such as refineries and other petroleum industries, while pyrogenic PAHs tend to occur on a broader environmental scale.

In general, most environmental monitoring programs focus on 34 specific PAH structures or a subset of these compounds. These compounds may be evaluated individually or they may be combined and evaluated as a mixture, referred to as Total PAH. This toxicological profile focuses on a group of commonly occurring unsubstituted PAHs at hazardous waste sites: acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. This profile also includes data on naphthalene, which is a PAH, but is sometimes treated separately from other PAHs due to its volatility.

With limited exceptions, PAHs are not currently used for purposes other than research (ATSDR 1995). Non-research uses for anthracene, acenaphthene, fluorene, fluoranthene, and phenanthrene include dye and other chemical intermediates; manufacture of synthetic fibers, chemotherapeutic agents, pharmaceuticals, plastics, and explosives; biocides; smoke screens; scintillation counter crystals; and metal pipe and container liners (ATSDR 1995). Naphthalene is produced from either coal tar or petroleum and used as an intermediate in production of phthalic anhydride; in production of carbaryl insecticide, synthetic leather-tanning agents, naphthalene sulfonates, and other organic chemicals; and as a moth repellent and deodorizer (ATSDR 2005).

PAHs are released to the environment from both natural and anthropogenic sources, but anthropogenic sources are greater (ATSDR 1995). Natural releases may result from volcanic emissions, fires, synthesis by microbes and plants, and seepage of crude or shale oils (ATSDR 1995; Eisler 1987). Anthropogenic releases to air, water, and soil occur from many stationary and mobile sources: residential wood burning; industrial power generation; incineration; coal tar, coke, creosote, asphalt, manufactured gas, wood preservative, phthalic anhydride, and naphthalene production; petroleum catalytic cracking; environmental tobacco smoke; moth repellents; kerosene space heaters; gas cooking and heating appliances; gasoline and diesel vehicular exhaust; airborne deposition; municipal and industrial wastewater discharge, aeration, and sludge disposal; runoff; oil spills; petroleum pressing; leaching; and soil compost and fertilizers (ATSDR

1995 and 2005). Unlike most other organic chemicals, PAHs are not released in a pure or well characterized form, and they always occur in the environment as complex mixtures.

25.2 Environmental Fate and Transport

PAHs are considered persistent organic pollutants, but may undergo a variety of processes in abiotic environmental media, including volatilization, photolysis, oxidation, biodegradation, and binding to solid media. Each of these processes is discussed briefly below. Degradation of PAHs in water depends in part on the temperature oxygen content of the water (ATSDR 1995). Degradation in soils and sediments depends in part on soil organic content, soil structure, environmental factors, the presence of microbicidal contaminants, and the characteristics of the microbes and PAHs in question (ATSDR 1995). Greater pollution of environmental media can enhance biodegradation of PAHs by stimulation of metabolic pathways in microbes (ATSDR 1995 and 2005).

Physico-chemical properties that determine the fate of individual PAH compounds depend in part on the molecular weight and ring structure of the PAH. For this purpose, low molecular weight (LMW) PAHs (LMW; 2 to 3 rings) include naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene. High molecular weight (HMW) PAHs (HMW; 4 rings or more) include fluoranthene, pyrene, chrysene, benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

LMW PAHs have higher Henry's law constants and tend to volatilize from water and soil, especially at high temperatures, shallow depth, and high wind (ATSDR 1995). Under less ideal conditions, processes other than volatilization may be more important (ATSDR 1995). Volatilization from water and soil is an especially important process for naphthalene (ASTDR 2005). HMW PAHs can volatilize, but they have lower Henry's law constants, and the importance of this process is more limited (ATSDR 1995).

In general, PAHs have low water solubility and higher K_{oc} values that indicate moderate to high affinity for organic carbon (ATSDR 1995). Thus, in aquatic systems, most of the total amount of PAHs is typically sorbed to suspended particulate matter or sediments rather than being in the dissolved phase (ATSDR 1995). HMW PAHs have higher K_{oc} values and higher affinities for organic carbon, which may either enhance or reduce their partitioning to sediments or soils from other materials, such as charred leaf litter, depending on the relative organic carbon contents of those materials (ATSDR 1995). Sorption will be lower in sand and higher in silt and clay (ATSDR 1995). LMW PAHs are more likely to be desorbed and recycled back into the water column from sediments (ATSDR 1995), whereas HMW PAHs tend to remain mostly associated with particulate phases in water (ATSDR 1995). Naphthalene has somewhat higher solubility and lower K_{oc} than other PAHs and is expected to mostly remain in solution in water rather than associating with suspended solids or sediments and to move more easily through soil (ATSDR 2005).

Photo-oxidation and chemical oxidation, but not hydrolysis, are important degradation processes for PAHs in water (ATSDR 1995). Unlike other processes, rates of photolysis do not correlate well with the molecular weight of PAHs; half-life data suggest that photolysis in water may be important for acenaphthene, acenaphthylene, anthracene, pyrene, benzo(a)pyrene, and benz(a)anthracene, but another study reported that phenanthrene was also susceptible and that pyrene and benzo(a)pyrene were resistant (ATSDR 1995). Photolysis can be influenced by depth, turbidity, and other compounds in water (ATSDR 1995). PAHs can also be chemically oxidized by chlorination and ozonation. Photolysis, hydrolysis, and chemical oxidation are generally not considered important degradation processes for PAHs in soils and sediments, especially for HMW PAHs (ATSDR 1995).

Biodegradation by aquatic microorganisms such as bacteria and fungi is an important removal process for PAHs in water, but is very slow in anoxic conditions (ATSDR 1995). Borden et al. (1989) suggested that dissolved oxygen at >0.7 mg/L and total PAH concentrations >30-70 µg/L would be sufficient for aerobic biodegradation to proceed. As with photolysis, biodegradation is not necessarily predictable by molecular weight. Data suggest that naphthalene and phenanthrene may biodegrade most readily in water; anthracene, benz(a)anthracene, chrysene, and fluorene may biodegrade if in sediment water slurries; and benzo(a)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene and other PAHs with five or more rings may not biodegrade readily at all (ATSDR 1995).

Biodegradation by microorganisms is the most important degradation process for PAHs in soil. In general, LMW PAHs are degraded much faster than HMW PAHs (ATSDR 1995). However, bioavailability can be limited by factors such as sorption of PAHs to organic matter in soil and aging (ATSDR 1995; USEPA 2007).

25.3 Uptake and Bioaccumulation

PAHs are lipophilic and can rapidly bioaccumulate in biota from water, sediments, soil, and food. Less soluble PAHs are typically taken up more readily in the gastrointestinal tracts of animals (USEPA 2007), although PAHs are generally poorly absorbed in mammals (Eisler 1987).

In general, bioconcentration is higher for HMW than LMW PAHs but can vary by taxa based on the ability of organisms to metabolize parent PAHs to other compounds (ATSDR 1995). Studies of benzo(a)pyrene in algae suggest that adsorption was a primary uptake route, that benzo(a)pyrene was transformed, and that sensitivity was linked to light regimes. Fish can metabolize PAHs in the liver and excrete the metabolites in feces and urine, and most crustaceans possess the required enzymes for metabolism; these organisms tend to take up PAHs easily from food, although dietary exposure sometimes contributes a limited amount to body burdens compared to water exposure. Due to metabolic ability, PAH concentrations in fish are typically low, and HMW PAHs do not seem to accumulate well in fish; some data suggest that skin as well as lipids may be a temporary site of accumulation and may pose a barrier to the migration of PAHs in tissues. Mollusks and some other invertebrates may be unable to metabolize PAHs efficiently, although they can

eliminate them. Studies of marine mollusks have found that LMW PAHs were bioconcentrated more or less than HMW PAHs, but generally agree that LMW PAHs were more readily eliminated. Sediment can also be a significant source of body burdens of PAHs for benthic invertebrates and fish. Biomagnification through aquatic food chains has not been observed, probably because of rapid biotransformation and elimination (ATSDR 1995; Eisler 1987).

Mammals are also able to rapidly and extensively metabolize PAHs via liver enzymes; thus, unsubstituted PAHs do not accumulate at high concentrations in fat in mammals despite their liphophilicity (Eisler 1987). In one study, two voles exposed to creosote coal tar distillate in a terrestrial microcosm for 19 to 26 days contained whole-body concentrations that exceeded soil concentrations by factors of 12 for phenanthrene and 31 for acenaphthene, but the acenaphthene was bound in the gastrointestinal tract (ATSDR 1995).

In newt larvae, benzo(a)pyrene was taken up in a non-dose-dependent manner, reaching maximum levels after 12 hours at a ratio between larvae and water of approximately 200; upon transfer to uncontaminated water, benzo(a)pyrene was well eliminated (Pauli et al. 2000).

Uptake or sorption of PAHs by terrestrial plants from soil can occur via roots or foliage and depends on the plant species and concentration, solubility, and molecular weight of the PAH (ATSDR 1995). More soluble PAHs are taken up more readily by plants (USEPA 2007). After uptake, PAHs may be translocated, metabolized, or photodegraded (Eisler 1987). In general, plant uptake and any biomagnification through terrestrial food chains is low (ATSDR 1995). For example, ratios of total PAH concentrations in vegetation to soil have been reported from 0.001 to 0.18, and several studies have found inconsistent relationships between soil and plant tissue concentrations that may be partly due to PAH sorption to roots and foliage (ATSDR 1995). Generally, PAH concentrations in plants are greater on plant surfaces, in aboveground plant parts, and in broad-leafed plants, partly because atmospheric deposition and adsorption of particulate matter is important (ATSDR 1995; Eisler 1987).

Equilibrium partitioning theory predicts that nonionic chemicals such as PAHs partition in sediment between sediment organic carbon, interstitial (pore) water, and benthic organisms. Biological responses to PAHs in different sediments are similar when PAH concentrations are normalized to an organic carbon basis (i.e. $mg/kg_{organic\ carbon}$). To predict sediment toxicity from PAHs, USEPA recommends calculation of an Equilibrium Partitioning Sediment Benchmark Toxic Unit ($\Sigma ESBTU_{FCV}$), which uses Final Chronic Values (FCVs) for 34 individual PAHs based on octanol-water partition coefficients (K_{ow}) and water-only acute and chronic toxicity data. If $\Sigma ESBTU_{FCV}$ >1.0, toxic effects on sensitive benthic organisms may be expected. This approach assumes additive toxicity of the individual PAHs and at least 0.2 percent organic carbon by dry weight in sediment (USEPA 2003).

25.4 Toxicity

The aquatic toxicity of PAHs may be mitigated by several factors: HMW PAHs tend to have low acute toxicity, possibly due to low water solubility; PAH concentrations in even heavily polluted water are usually far below levels required for acute toxic effects; and PAHs in sediment may be less bioavailable and less toxic than PAHs in solution (Eisler 1987). Among aquatic organisms, crustaceans are most sensitive, and teleost fish are least sensitive (Eisler 1987).

Toxic effects of PAH exposure in various taxa may include effects on photosynthesis, mobility, blood chemistry, skin, hematopoietic system, small intestine, kidneys, mammary glands, immune system, respiratory and cardiovascular systems, liver, gallbladder, spleen, reproduction, growth, and survival (USEPA 2007; Eisler 1987; Canada 1994). However, much literature on PAHs focuses on carcinogenesis. Many HMW PAHs are known or suspected genotoxins, mutagens, and carcinogens (Eisler 1987). Neoplasms or related disorders have been observed in connection with high exposure to PAHs in terrestrial and aquatic organisms, including invertebrates and fish. Intraspecies and interspecies differences in response as well as significant interactions between PAHs of differing potential carcinogenicity make characterizations of the specific carcinogenic contribution of PAHs in the field difficult (Eisler 1987).

PAHs are typically of low toxicity to terrestrial plants. Terrestrial plants may synthesize PAHs, which may act as growth hormones (Eisler 1987). Some plants also synthesize chemicals that can protect against the mutagenic and carcinogenic effects of PAHs (Eisler 1987).

PAHs in sediment have been associated with effects on benthic invertebrates, including reproductive effects and changes in community abundance and structure (Canada 1994). A variety of carcinogenic (especially in the liver), teratogenic, and other developmental effects have been observed in fish in connection with PAH exposure in water and sediment.

Several studies have reported genotoxic effects in amphibian larvae (Pauli et al. 2000). Several studies involving exposure of amphibians to PAHs via implantation or injection show that tumors may develop subsequent to PAH exposure, and amphibians and reptiles may possess enzymes in the liver or skin similar to those that metabolize PAHs in fish and mammals; however, amphibians are fairly resistant to PAH carcinogenesis compared to mammals (Eisler 1987).

PAHs can induce tissue damage and tumors in mammals after acute or chronic exposure periods and at local or distant sites depending on the species, route of administration, and metabolites for a particular PAH; targets may include the hematopoietic and immune systems, skin, small intestine, kidney, mammary gland, and liver (Eisler 1987). The probability of teratogenesis is not clear due to laboratory experiments that employed doses much greater than realistic environmental exposures (Eisler 1987), but reproductive and developmental effects are possible. Chemicals such as selenium, vitamins A and E, ascorbic acid, and

others may inhibit tumor development induced by PAH exposure (Eisler 1987). For the purpose of this initial review, the toxicity data presented in the appendices focus on data for total PAHs or LMW and HMW PAHs; additional information may be evaluated for individual PAH compounds as the evaluation is refined.

26. Polychlorinated Biphenyls (PCBs)

26.1 Overview

PCBs are a group of chemicals that were produced between 1929 and 1978 in the United States for use primarily as industrial coolants, insulators, and lubricants, particularly in transformers and capacitors. PCBs were widely used in fire prevention, insulation materials, and the manufacture of transformers, capacitors, electromagnets, circuit breakers, voltage regulators, and switches because of their stability and resistance to high temperatures. Fluids containing PCBs were also used in hydraulic systems and as plasticizers and additives in lubricating and cutting oils.

PCBs comprise 209 individual congeners with 1 to 10 chlorine atoms attached to a biphenyl molecule. PCBs may also be grouped in the following ways:

- Homologues: Homologue groups are defined by the number of chlorines in their PCB molecules. For example, hexachlorobiphenyls have six chlorines each.

- Aroclors: Aroclors are the trade names for commercial PCB mixtures that contain variable combinations of congeners. Aroclors were the most common form in which PCBs historically entered the environment. The name of an Aroclor indicates the approximate percentage of chlorine in the mixture by weight (for example, Aroclor 1260 is approximately 60 percent chlorine by weight). The exception is Aroclor 1016, which is approximately 41 percent chlorine by weight.

- Coplanar/Non-Coplanar: Coplanar PCBs contain fewer than three chlorines in the *ortho* positions on the biphenyl molecule. These PCBs are significantly more toxic to higher animals and are thus considered to be of greater concern for ecological and human health.

- Total PCBs: Available literature and toxicological information on PCBs is often presented as Total PCBs, representing the sum total concentration of PCBs measured (i.e., sum of homologues, sum of Aroclors, or sum of congeners).

Release of PCBs to the environment occurred as the result of industrial discharges, leaks from supposedly closed systems, disposal of PCB wastes to municipal sewage treatment plants, landfills and equipment dumps, and especially through atmospheric transport of incompletely incinerated PCBs (Eisler 1987). The same chemical properties that made PCBs useful to industry are now responsible for persistent levels of PCBs remaining in the environment. The manufacture and use of PCBs was banned in the United States in 1979; however, they are still a ubiquitous contaminant worldwide as a result of human activities and their persistence in the environment.

26.2 Environmental Fate and Transport

PCBs are extremely stable and slow to chemically degrade in the environment (Eisler 1987). Microbial degradation depends on the degree of chlorination and the position of the chlorine, with lower chlorinated compounds more readily transformed. There is a wide range of volatility among the congeners according to the degree of chlorination (Wenning et al. 2011).

PCBs are generally ubiquitous in the aquatic environment, particularly in sediments. They may enter aquatic systems from wet and dry deposition, river inflows, groundwater flow, and direct and indirect discharged from industrial facilities. Once in aquatic systems, PCBs relatively quickly partition into the more nonpolar compartments of the ecosystem or are physically adsorbed on particular matter (Eisler 1987). PCBs are relatively insoluble in water, but freely soluble in nonpolar organic solvents and in biological lipids (Eisler 1987). Solubility decreases with increasing chlorination. PCBs are strongly adsorbed on soils, sediments and particulates in the environment (Eisler 1987).

The chemical properties of PCBs change depending on the numbers of chlorines. Chlorination affects the solubility and volatility of a PCB; the degree to which it sorbs to organic matter; and the ability of biota to excrete the PCB rather than retain it in body tissues. As a result, the individual congeners have the potential to bioaccumulate to different extents. In addition, PCB mixtures in environmental media change in composition over time as chlorination decreases, a process known as weathering, which also potentially affects bioavailability.

26.3 Uptake and Bioaccumulation

PCB molecules are hydrophobic (have low solubility in water), adhere readily to organic matter in soil or sediment, and may bioaccumulate in fatty tissue in fish or other animals. Thus, the highest levels of exposure to PCBs in the environment typically occur through the food chain via ingestion of food items, rather than by direct contact with soil, sediment, air, or water. Many physical, chemical, and biological processes can affect the bioavailability and subsequent uptake of PCBs at a site, including the organic carbon present in sediment or soil and the lipid content in the receptor species.

In mammals, PCBs are readily absorbed and initially concentrate in the liver, blood, and muscle. Eventually, accumulations are highest in adipose tissue and skin. PCBs can be transferred to young mammals either transplacentally or in breast milk. Accumulation and metabolism are related to chlorination with higher chlorinated compounds more difficult to metabolize and more likely to accumulate (Eisler 1987).

26.4 Toxicity

PCB toxicity varies among different species of animals, however the typical response includes wasting syndrome, hepatotoxicity, immunotoxicity, neurotoxicity, reproductive and developmental effects, gastrointestinal effects, respiratory effects, dermal toxicity, and mutagenic and carcinogenic effects. In general, reproductive effects tend to be the most sensitive endpoint. They may also act as endocrine disruptors. Toxicity is believed to be related to the ability of the congeners to induce cytochrome P450-dependent aryl hydrocarbon metabolizing mixed-function oxidase. For example, a number of PCB congeners have been shown to induce aryl hydrocarbon hydroxylase activity, as well as ethoxyresorufin-O-deethylase activity. Toxicity via this route is mediated by the ability of the chemical to bind to the aryl hydrocarbon receptor (AhR).

There are limited data regarding toxicity of PCBs to plant species. There is some indication that plants grown on soils containing PCBs may accumulate low levels, particularly of the lower chlorinated congeners (Eisler 1987). In addition, sublethal effects have been observed in some plant species grown in PCB-containing soils (Eisler 1987). PCBs incorporated into phytoplankton exert inhibitory effects on photosynthesis and cell motility (Eisler 1987).

Invertebrates do not have an AhR and have a limited cytochrome P450 detoxification system. As a result, PCB toxicity to invertebrates is generally less than that observed in vertebrate species. Crustaceans and younger developmental stages appear to be the most sensitive groups, and lower chlorinated compounds appeared to be more toxic. The ability of invertebrates to accumulate PCBs from sediment or the water column makes them good indicator species.

PCB effects may be associated with the survival, growth, and reproduction of individuals within the local populations of fish and wildlife species, with reproduction broadly defined to include egg maturation, spawning, egg hatchability and survival of fish larvae. The most sensitive endpoint for effects of PCB on fish are found during early life stage survival and recruitment as a result of PCB transfer from maternal tissue to eggs. Berlin et al. (1981) evaluated laboratory exposure to PCBs (specifically Aroclor 1254) and dichlorodiphenyldichloroethylene, individually, and as a mixture, by lake trout eggs and fry through 176 days of exposure. Fry growth and survival were assessed, and fry mortality was observed to be the more sensitive endpoint (growth was not significantly affected by any of the contaminant exposures).

Few detailed studies have been performed on toxicity of PCBs to amphibians and reptiles. PCBs have been detected in fat, liver, and muscle tissues of water snakes (Eisler 1987). Snapping turtles (*Chelydra serpentia*) have been shown to be capable of storing high concentrations of PCBs in their fat without any apparent detrimental effects (Eisler 1987).

As a group, birds are more resistant to acutely toxic effects of PCBs than mammals. Signs of PCB poisoning among birds included morbidity, tremors (which may become continuous), beak pointed upwards, and muscular incoordination. Bird embryos are the most sensitive life stage for assessing the effects of contaminants. PCBs have also been linked to lethality and deformities in embryos and chicks. Elevated PCBs may also impact productivity of wild birds, based on long-term studies in areas with elevated concentrations such as the Great Lakes (Harris and Elliott 2011).

There is significant variability in response to PCBs within and among bird species. In particular, it appears that the domestic chicken is considerably more sensitive to PCBs and other dioxin-like compounds than most wild bird species (Hoffman et al. 1998; Head et al. 2008; Harris and Elliott 2011). Most bird tissues and eggs collected have measurable concentrations of PCBs.

27. Organochlorine Insecticides

27.1 Overview

Organohalogen compounds are persistent hydrocarbon compounds containing a halogen group (e.g., chlorine or bromine) that substitutes for hydrogen in different positions on the hydrocarbon. Although they may occur naturally, the presence of these compounds, particularly the organochlorines, in the environment is largely associated with their production and use as pesticides. These compounds became widely used in agriculture beginning in the 1940s, and continued throughout the 1950s and 1960s (CDC 2010; Beckvar and Lotufo 2011). Many of their uses have been cancelled or restricted by the USEPA as the result of increasing evidence regarding their environmental persistence and potential adverse effects on wildlife and human health. However, although many of these compounds are no longer widely used in the United States, other countries continue to use them. Organochlorine pesticides can enter the environment after pesticide applications, disposal of contaminated wastes into landfills, and releases from manufacturing plants that produce these chemicals.

Based on chemical structure, the organochlorine pesticides can be placed into five groups, dichlorodiphenyl trichloroethane and related compounds, hexachlorocyclohexane, cyclodienes (i.e., aldrin, dieldrin, endrin, heptachlor, and chlordane) and related compounds, mirex and toxaphene. This profile focuses on the cyclodienes, with particular emphasis on chlordane. Technical chlordane is actually a mixture, with an approximate composition of 19 percent cis-chlordane, 24 percent trans-chlordane, 21.5 percent chlordane isomers, 10 percent heptachlor, 7 percent cis-and trans-nonachlor, 2 percent Diels-Alder adduct of cyclopentadiene, and pentachlorocyclopentadiene, 1 percent hexachlorocyclopentadiene, 1 percent octachlorocyclopentene, and 15.5 percent miscellaneous constituents (NRCC 1975; IARC 1979; USEPA 1980; WHO 1984).

27.2 Environmental Fate

In general, the organochlorine pesticides have low aqueous solubility and tend to bind to particulates and organic matter. They also bind strongly to sediments. Many are semivolatile are dispersed great distances through the atmosphere (Beckvar and Lotufo 2011). These chemicals are lipophilic, so they are readily taken up into the aquatic food chain, and they biomagnify.

Similar to the other cyclodienes, chlordane attaches strongly to particles in the upper layers of soil and is unlikely to enter groundwater. It is very persistent, remaining in some soils for over 20 years. Persistence is greater in heavy, clayey or organic soil than in sandy soil. In water, some chlordane attaches strongly to sediment and particles in the water column and some is lost by evaporation. It is not known whether much breakdown of chlordane occurs in water or in sediment. Chlordane breaks down in the atmosphere by reacting with light and with some chemicals in the atmosphere. However, it is sufficiently long lived that it

can travel long distances and be deposited on land or in water far from its source. Chlordane or the chemicals that chlordane changes into accumulate in fish, birds, and mammals.

27.3 Uptake and Bioaccumulation

All organochlorine pesticides are highly bioaccumulative, a primary reason they are such effective pesticides. The individual forms of chlordane vary in their uptake and bioaccumulation. Cis-chlordane was more toxic to goldfish (*Carassius auratus*) than was trans-chlordane because of its comparatively rapid uptake from the medium and lengthy storage in body tissues, estimated at 99 percent after 25 days (Feroz and Khan 1979).

Chlordane is readily absorbed by homeotherms (i.e., warm-blooded animals) through skin, diet, and inhalation, and distributed throughout the body. In general, residues of chlordane and its metabolites are not measurable in tissues 4 to 8 weeks after exposure, although metabolism rates varied significantly between species. Food chain biomagnification is usually low, except in some marine mammals. In most mammals, the metabolite oxychlordane has proven much more toxic and persistent than the parent chemical.

27.4 Toxicity

As a group, the cylcodienes are characterizes as the most acutely toxic of the organochlorine pesticides (Elliott and Bishop 2011). There is variation in toxicity between the compounds, likely because of their varying ability to be metabolized. For example, chlordane can be metabolized to form a number of different metabolic products including heptachlor and heptachlor expoxide, which may be more toxic than chlordane itself. However, all of the cyclodienes act through a central nervous system mechanism, with dietary exposure considered the most important route (Elliott and Bishop 2011).

Elevated concentrations of organochlorine pesticides inhibited growth of *Chlamydomonas sp.*, as well as the green algae *Scenedesmus quadricauda* elicited growth inhibition (Glooschenko et al. 1979; Glooschenko and Lott 1977). Acute toxicity of organochlorine pesticides to aquatic organisms has long been noted with many studies noting the rapid death of sensitive organisms at relatively low tissue concentrations and the accumulation of higher residues in the remaining resistant organisms (Beckvar and Lotufo 2011). At low concentrations, pink shrimp (*Farfantepenaeus duorarum*) are similarly susceptible to chlordane as grass shrimp (*Palaemonetes pugio*). In contrast, similarly exposed *Crassostrea virginica* were associated only with decreased growth, with no apparent effects on mortality. Signs of chlordane poisoning in fish included hyperexcitability, increased respiration rate, erratic swimming, loss of equilibrium, and convulsions; death frequently occurred within 12 hours of exposure (NRCC 1975).

Pesticides applied to control insects can inadvertently harm reptiles and amphibians. However, very few studies have been conducted to directly evaluate the potential impacts of these compounds on these types

of species and the majority of the evidence is indirect or anecdotal. For example, shortly after chlordane was applied to wooden huts in Australia for termite control, large numbers of dead skinks (*Morethia boulengeri, Lerista puctorittata*) and frogs (*Litoria caerulea, L. peronii*) were discovered, presumably killed by the chlordane (Eisler 1990).

Signs of chlordane intoxication in birds include sluggishness, drooped eyelids, fluffed feathers, low crouching on perch, reduced food intake, and weight loss. Later, afflicted animals rested on their breasts, wings spread, quivering and panting rapidly, back arched, neck arched over the back, and convulsing (Stickel et al. 1983).

Chlordane toxicity in mammals is often realized as labored respiration, muscle tremors, incoordination, convulsions, and sometimes death. Mice (*Mus sp.*) exposed to chlordane produced liver cancer in both sexes of two different strains of mice (USEPA 1980; WHO 1984; Tojo et al. 1986).

28. Radionuclides

28.1 Overview

All matter is comprised of atoms, which in turn contain subatomic particles. Atoms of the same element all have the same number of protons, but may have varying numbers of neutrons, creating isotopes. If the number of protons and neutrons in the nucleus is balanced, the atom is stable and is referred to as a stable isotope. However if the nucleus does not have the same number of protons and neutrons, the atom is unstable and is referred to as a radioisotope or radionuclide (Sample and Irvine 2011). Radioactive isotopes behave in a chemically identical manner to non-radioactive isotopes; it is the toxicity of radioactive forms that may differ from non-radioactive forms.

Ionizing radiation can be both naturally-occurring and anthropogenic in origin. Natural background sources include sunlight, cosmic rays and naturally-occurring radionuclides from geologic sources. Anthropogenic sources include uranium mining operations, nuclear weapons production and testing, nuclear power plants, and accidental releases. Nuclear explosions and nuclear power production are the major sources of anthropogenic activity in the environment. But radionuclide use in medicine, industry, agriculture, education, production and transport, and disposal from these activities present opportunities for wastes to enter the environment (Eisler 1994). Radiation has been used in the treatment of diseases such as an enlarged thymus, tinea capitis, acne, and cancer and as well as for X-rays by physicians and dentists (Eisler 1994).

The radionuclides evaluated in this toxicological profile included ^{40}K, ^{226}Ra, ^{228}Ra, ^{228}Th, ^{232}Th, ^{234}U, ^{235}U, ^{238}U, ^{137}Cs, and ^{60}Co. Because cobalt is the subject of another toxicological profile, the environmental fate and accumulation of ^{60}Co will not be analyzed. Data throughout the profile are reported in the units given in the source documents. Table 3 presents various historical and international units used to describe radioactivity. Tables 4 and 5 present information on the occurrence in the environment, radioactive characteristics, uses, and sources of release to the environment for the radionuclides and their parent elements named above.

28.2 Environmental Fate and Transport

The environmental fate and transport of a radionuclide is governed by the chemistry of the element, not by its radioactive character. Fate and transport processes for each element are summarized generally below. Table 6 presents information on the primary oxidation states for each element and the typical solubility of its compounds.

Potassium: Potassium does not occur freely in nature, and its salts are typically readily soluble in water. However, potassium binds preferentially to soil and more tightly to clay and loam soils (Argonne 2005).

Radium: Radium is primarily found as a divalent ion in water, and the solubility of radium salts generally increases with increasing pH. However, concentrations of radium in water are usually controlled by adsorption and precipitation processes, such as precipitation with barium compounds or binding to clay or organic minerals, and radium is readily strongly adsorbed by sediments, soils, and other solid media. Thus, radium is not very mobile in the environment (ATSDR 1990a and 1999).

Thorium: Soluble thorium ions hydrolyze at pH greater than 5 and precipitate or form hydroxy complexes that adsorb to suspended particulate matter; thus, concentrations of thorium in water tend to be low, unless soluble complexes with carbonate and humic materials form, because most thorium is associated with particulate matter or sediment (ATSDR 1990b). Adsorption is expected to be higher for fine-grained particles and in the presence of iron and manganese compounds (ATSDR 1990b). The same principles that govern mobility of thorium in water also govern its mobility in soil (ATSDR 1990b).

Uranium: In water, suspended solids and sediments are generally sinks for uranium, depending on pH, oxidation-reduction potential, and availability and nature of sorbents, ligands, and complexing materials (ATSDR 2011). For example, uranium may be in solution as a carbonate complex in aerobic, alkaline water but in solution as a soluble organic complex in acidic water with low concentrations of inorganic ions and high dissolved organic matter (ATSDR 2011). Generally, hexavalent uranium is more soluble and mobile than tetravalent uranium. In anoxic, reducing water or sediment (e.g., presence of hydrogen sulfide, organic matter, or appropriate microbes), hexavalent uranium can be reduced to insoluble tetravalent uranium and be deposited (ATSDR 2011). Uranium can also adsorb to iron and manganese oxides (ATSDR 2011). Similar principles generally govern the mobility of uranium in soil, which tends to be low (ATSDR 2011). However, some microorganisms can oxidize iron ions that convert insoluble uranium dioxide to soluble uranyl (UO_2^{+2}) ions that are more mobile (ATSDR 2011).

Cesium: Despite the high solubility of cesium compounds, cesium in water is expected to adsorb to suspended solids and be deposited in sediment (ATSDR 2004a). Similarly, cesium has low mobility in soil and tends to remain in surface soil (ATSDR 2004a).

28.3 Uptake and Bioaccumulation

The uptake of a radionuclide by biota is governed by the chemistry of the element, not by its radioactive character. Uptake and accumulation processes for each element are summarized below. In general, lower trophic levels in aquatic environments will contain higher concentrations of radionuclides than higher trophic levels (Eisler 1994), but this can be modified by age, size, sex, tissue, season, growth state, and other variables. Studies in aquatic environments suggest that detritus from and accumulation by phytoplankton, zooplankton, and benthic organisms can contribute significantly to movement of radionuclides to sediments (Eisler 1994).

Potassium: Potassium is an essential nutrient for living organisms; thus, all plants and animals take up potassium from the environment or through the diet, distribute it to cells and tissues, and regulate it closely by homeostatic processes (Argonne 2005).

Radium: Plants may absorb radium from soil. However, since, radium binds to clay or organic minerals in soil, terrestrial plants are generally unable to take up radium through roots (ATSDR 1999). BCFs for ^{226}Ra have been measured at 0.0011 to 6.5 (ATSDR 1990a). BCFs in freshwater fish have ranged from 1 to 60 in flesh and 40 to 1,800 in bone (ATSDR 1990a); entry into the food chain is assumed to begin with ingestion of suspended solids by bottom-feeding organisms (ATSDR 1990a).

Thorium: Plants may absorb thorium from soil through roots, where it tends to remain (ATSDR 1990b). Aquatic organisms may be able to accumulate high thorium concentrations relative to water exposures. Copepods have significantly higher BCFs than do rainbow trout; biomagnifications is unlikely (ATSDR 1990b).

Uranium: Uranium can be deposited on plants from the atmosphere or taken up by roots; however, the uptake relationship is not well understood. Some studies have hypothesized that plants may not take up uranium well from soil due to uptake only in the outer membrane of roots, while others have reported that they may transfer uranium at low levels to leaves and fruits, with most remaining in the roots (ATSDR 2011). Uptake in plants is likely to be greater in soil that contains high levels of available uranium due to formation of soluble uranium complexes or low sorption of uranium to soil and may also be greater if plants are not acclimated to uranium (ATSDR 2011). Similar to terrestrial plants, aquatic plants may adsorb or take up uranium from water (ATSDR 2011). Diet may be an important mechanism by which uranium moves through the food chain; however, a study in two marine invertebrates indicated that uptake from water was likely to be the primary source of uranium in those organisms (ATSDR 2011).

Cesium: Like potassium, cesium is distributed ubiquitously through biota (Eisler 1994). Cesium can accumulate and biomagnify in aquatic food chains. Accumulation of ^{137}Cs is expected to be reduced in water with high humic content and high potassium levels, but generally higher in freshwater than saltwater due to high potassium concentrations in saltwater (ATSDR 2004a). Studies in Canada have found a 4-fold increase in ^{137}Cs levels with each trophic level in a river and biomagnifications factors of 1.9 to 3.5 for lake trout populations relative to food sources (ATSDR 2004a). Uptake of cesium into plants from soil can be reduced by cesium binding to clay and zeolite minerals or exchanging with potassium but enhanced by adsorption to organic matter (ATSDR 2004a).

28.4 Toxicity

Biota are exposed to background levels of radiation from a variety of sources, including from rocks and soils, from food and water, and from cosmic radiation (ATSDR 1999). Radionuclides from anthropogenic

creation or use of radioactive materials, such as atmospheric weapons testing, are also sources of radiation (Eisler 1994). Radiation doses can be received externally or internally depending on whether the source is located outside or inside the body (ATSDR 1999). Doses depend on altitude, ambient concentrations of radionuclide, and uptake (Eisler 1994).

High and acute doses of ionizing radiation produce adverse biological effects on molecules, cells, tissues, organs, whole organisms, populations, communities, and ecosystems, including cell death, mutations and cancer, altered behavior, inhibition of reproduction, and reduced growth and survival (Eisler 1994). Population and community case studies of adverse effects of radiation are provided by events such as proving at Pacific atolls and the Chernobyl accident (Eisler 1994). However, low exposures can occasionally be considered beneficial (Eisler 1994). Beneficial effects of radiation in mammals may include increased fecundity or lowered sterility, accelerated wound healing, and increased survival and longevity (Eisler 1994).

Sensitivity to radiation within and between taxa varies widely and is modified by many abiotic and biotic variables. On a broad scale, higher animals such as mammals, birds, amphibians, reptiles, fish, and crustaceans are considered most sensitive, while higher plants are intermediate, and more primitive invertebrates and microorganisms tend to be most resistant (Eisler 1994).

Cell death is one of the first and primary effects of ionizing radiation. Typically, cells are most sensitive to radiation damage if they have a high mitotic rate, a long mitotic cycle, and are undifferentiated (ATSDR 1999). For example, bone marrow, skin, gut lining, and reproductive cells may be particularly sensitive (Eisler 1994). Target tissues may include the skeleton for ^{40}K, ^{226}Ra, and ^{228}Ra; the kidney for ^{234}U, ^{235}U, and ^{238}U; and the whole body (including liver, kidney, and skeletal muscle) for ^{137}Cs and ^{60}Co (ATSDR 1999; Eisler 1994). Early life stages of animals are more susceptible to radiation damage than adults (Eisler 1994). Since DNA is also extremely sensitive to ionizing radiation, mutagenic and carcinogenic effects often occur (Eisler 1994).

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Table 1. Screening Values for Aquatic Exposures

COPECS	Direct Exposure Sediment (mg/kg)[a]	Direct Exposure Water (µg/L)[b]	
		Chronic	Acute
Aluminum	225000[c]	87	750
Antimony	12	160	1,300
Arsenic	7.24	190	360
Barium	ND	ND	ND
Beryllium	ND	0.53	16
Boron	ND	750	50000
Cadmium	1	0.66	1.79
Chromium	52.3	11	16
Cobalt	50[c]	ND	ND
Copper	18.7	6.54	9.22
Iron	ND	1,000	ND
Lead	30.2	1.32	33.78
Manganese	1,100	ND	ND
Mercury	0.13	0.012	2.4
Molybdenum	ND	ND	ND
Nickel	15.9	87.71	789
PAHs	1684	ND	ND
PCBs	33	0.014	0.2
Pesticides - Chlordane	1.7	0.0043	2.4
RADs	ND	ND	ND
Selenium	ND	5	20
Silver	2	0.012	1.23
Strontium	ND	ND	ND
Thallium	ND	4	140
Vanadium	ND	ND	ND
Zinc	124	58.91	65.04

Notes:

ND = No Data

a. USEPA Region 4 Waste Management Division Sediment Screening Values for Hazardous Waste Sites unless otherwise noted.

b. USEPA Region 4 Waste Management Division Freshwater Surface Water Screening Values for Hazardous Waste Sites. Values correspond to Chronic (CCC) and Acute (CMC) Ambient Water Quality Criteria.

c. NJDEP Ecological Screening Criteria. http://www.state.nj.us/dep/srp/guidance/ecoscreening.

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Table 2. Screening Values for Mammalian and Avian Dietary Exposures

COPECS	Birds (mg/kg-bw/day)				Mammals (mg/kg-bw/day)			
	NOAEL	Notes	LOAEL	Notes	NOAEL	Notes	LOAEL	Notes
Aluminum	109.7	b	1090	b	1.93	b	19.3	b
Antimony	ND		ND		0.059	a	0.59	a
Arsenic	2.24	a	22.4	a	1.04	a	1.66	a
Barium	20.8	b	41.7	b	51.8	a	518	a
Beryllium	ND		ND		0.532	a	5.32	a
Boron	28	b	93.6	b	28.8	b	100	b
Cadmium	1.47	a	14.7	a	0.77	a	7.7	a
Chromium	2.66	a	26.6	a	2.4	a	24	a
Cobalt	7.61	a	76.1	a	7.33	a	73.3	a
Copper	4.05	a	12.1	a	5.6	a	9.34	a
Iron	ND		ND		ND		ND	
Lead	1.63	a	3.3	a	4.7	a	8.9	a
Manganese	179	a	1790	a	51.5	a	515	a
Mercury	0.45	b	0.9	b	1	b	10	b
Molybdenum	3.5	b	35.3	b	0.26	b	2.6	b
Nickel	6.71	a	67.1	a	1.7	a	3.4	a
PAHs-LMW	1,653	a	16,530	a	65.6	a	328	a
PAHs-HMW	2	a	20	a	0.615	a	3.07	a
PCBs	0.09	c	1.27	c	0.36	c	1.28	c
Pesticides								
Chlordane	2.1	b	10.7	b	4.6	b	9.2	b
Total DDX	0.227	a	2.27	a	0.147	a	0.735	a
RADs	NA	d	NA	d	NA	d	NA	d
Selenium	0.29	a	0.579	a	0.143	a	0.215	a
Silver	2.02	a	20.2	a	6.02	a	60.2	a
Strontium	ND		ND		263	b	2630	b
Thallium	0.35	e	3.5	e	0.015	f	0.075	f
Vanadium	0.344	a	3.44	a	4.16	a	8.31	a
Zinc	66.1	a	661	a	75.4	a	754	a

Notes:

NOAEL = No observed adverse effects level

LOAEL = Lowest observed adverse effects level

NA = Not Applicable

ND = No data

a. Eco SSLs (2003-2008). EcoSSLs identify the NOAEL; the LOAEL is from either the corresponding study, or is extrapolated from the NOAEL using a multiplying factor of 10. USEPA did not identify a TRV for PAHs for birds, so the lowest reported effect level from the studies assigned an Evaluation Source greater than 10 was used.

b. Sample et al. 1996. Values represent TRVs suggested by sample or extrapolated using a factor of 10.

c. CalEPA (2009) BTAG values for mammals and birds

d. Radionuclides will be evaluated using RESRAD, Version 6.22., November 2004

e. Schafer 1972

f. USACHPPM 2007

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Table 3. Units of Radioactivity and Radiation Exposure

Variable	Old Unit	Definition of Old Unit	New Unit	Definition of New Unit	Relationship
Activity	Curie (Ci)	1 Ci = 3.7×10^{10} disintegrations/s (dps)	Becquerel (Bq)	1 Bq = 1 dps	1 Ci = 3.7×10^{10} Bq
Exposure	Roentgen (R)		Coulomb/kg (C/kg)		1 R = 2.58×10^{-4} C/kg
Absorbed Dose	rad	1 rad = 100 erg/g	Gray (Gy)	1 Gy = 1 J/kg	1 rad = 0.01 Gy
Dose Equivalent	rem	1 rem = damage effects of 1 R	Sievert (Sv)	1 Sv = 1 J/kg	1 rem = 0.01 Sv

Ref: Eisler 1994

Table 4. Characteristics of Select Radionuclides

Radionuclide	Naturally Occurring?	Primary Emission	Physical Half-Life (years)	Reference
^{40}K	Yes	Beta	1.26×10^{9}	ATSDR (1999)
^{226}Ra	Yes	Alpha	1.6×10^{3}	ATSDR (1999)
^{228}Ra	Yes	Beta	5.76×10^{0}	ATSDR (1999)
^{228}Th	Yes	Alpha	1.913×10^{0}	ATSDR (1999)
^{232}Th	Yes	Alpha	1.4×10^{10}	ATSDR (1999)
^{234}U	Yes	Alpha	2.45×10^{5}	ATSDR (1999)
^{235}U	Yes	Alpha	7.04×10^{8}	ATSDR (1999)
^{238}U	Yes	Alpha	4.46×10^{9}	ATSDR (1999)
^{137}Cs	No	Beta, Gamma	3.0×10^{1}	ATSDR (1999)
^{60}Co	No	Beta, Gamma	5.271×10^{0}	ATSDR (1999), ATSDR (2004b)

Table 5. Occurrence, Use, and Sources of Environmental Release for Select Radionuclides and Elements

Radionuclide or Element	Occurrence and Example Uses	Example Releases	Reference
Potassium	Naturally occurring, ubiquitous, and abundant. Essential nutrient in living organisms. Agriculture, commercial and industrial reactions, medicine.	Natural or anthropogenic release of any material containing potassium, e.g. phosphate fertilizer use.	N/A
Radium	Naturally occurring and ubiquitous. Radiation therapy, radon source, metals radiography, neutron source in research. Historically used in smoke detectors; medicines; luminescent paints, especially for timepieces; ceramic glazes.	Anthropogenic: coal combustion and disposal, uranium mining and milling, phosphate fertilizer use.	ATSDR (1990a,1999)
Thorium	Naturally occurring and ubiquitous (primarily ^{232}Th). Nuclear fuel and weapons, refractory applications, lamp mantles, aerospace alloys, welding electrodes, ceramics, lighting.	Natural: volcanic emissions, windblown dust. Anthropogenic: coal, oil, or peat combustion; thorium, tin, uranium, and phosphate rock mining and processing; waste disposal.	ATSDR (1990b)
Uranium	Naturally occurring and relatively abundant (primarily ^{238}U). Commercial nuclear power, ship fuel, weapons, ammunition, guidance devices, counterbalances and counterweights, radiation shielding, x-ray targets, catalysts. Historically used in ceramics, glass, and dental porcelains.	Natural: wind and water erosion, volcanic emissions. Anthropogenic: uranium mining, milling, and processing; phosphate mining; coal combustion; shale oil processing; research; weapons; waste disposal; remediation.	ATSDR (2011)
^{137}Cs	From nuclear reactors. Sterilization of wheat, flour, potatoes, medical supplies; calibration for gamma ray spectroscopy; industrial and transportation radiography; radiation therapy.	Anthropogenic. Nuclear plant operation, testing, accidents, waste disposal; satellite re-entry.	ATSDR (2004a)
^{60}Co	From nuclear reactors. Radiation therapy; sterilization of medical supplies, food, consumer products, sludge, wastewater, wood; plastics production; radiography; chemical and metallurgical analysis; tracer studies.	Anthropogenic. Nuclear research, development, plant operation, accidents, waste disposal to ocean or landfills.	ATSDR (2004b)

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Table 6. Chemical Information for Select Elements

Element	Primary Oxidation States	Solubility	Reference
Potassium	1	Variety of salts; nearly all soluble.	NA
Radium	2	Soluble (e.g., chloride, nitrate) to insoluble (e.g., carbonate, sulfate).	ATSDR (1990a)
Thorium	4	Soluble (e.g., chloride, nitrate, sulfate) to insoluble (e.g., dioxide, carbonate, hydroxide).	ATSDR (1990b)
Uranium	+4, +6	Tetravalent typically not very soluble to insoluble (e.g., hydroxides, hydrated fluorides, phosphates); hexavalent more soluble (e.g., uranyl nitrate) to insoluble (e.g., oxides).	ATSDR (2011)
Cesium	1	Variety of salts; nearly all soluble.	ATSDR (2004a)

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Appendix A

Exposure Pathways – Plants

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Table A-1. Summary of Results from the EcoTox Database for Plants - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum chloride	Green algae	Algae	Fresh	Growth	EC30		I	7			ug/L	LAB	1994. Parent and Campbell. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum chloride	Green algae	Algae	Fresh	Growth	EC30		I	53			ug/L	LAB	1994. Parent and Campbell. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
NR	Green algae	Algae	Fresh	Growth	EC50		I	3			ug/L	LAB	1983. Helliwell et al. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum fluoride	Green algae	Algae	Fresh	Mortality	LC50		N	125895			ug/L	LAB	1998. Rai et al. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum chloride and fluoride	Green algae	Algae	Fresh	Physiology	NR		N	8393			ug/L	LAB	1998. Rai et al. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum, acidified	Green algae	Algae	Fresh	Pop Growth	EC50		I	60			ug/L	LAB	1983. Helliwell et al. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum fluoride	Green algae	Algae	Fresh	Pop Growth	LC50		N	8393			ug/L	LAB	1998. Rai et al. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum fluoride	Green algae	Algae	Fresh	Pop Growth	NOEC		N	1678			ug/L	LAB	1998. Rai et al. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum fluoride	Green algae	Algae	Fresh	Pop Growth	NOEC		N	33572			ug/L	LAB	1998. Rai et al. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.

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Table A-2. Summary of Results from the EcoTox Database for Plants - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Disodium salt	Algae	Algae, Moss, Fungi	NR	Growth	EC100		T	400000	NA	NR	ug/L	LAB	1984. Blanck, H., G. Wallin, and S.A. Wangberg. Species-Dependent Variation in Algal Sensitivity to Chemical Compounds. Ecotoxicol. Environ. Saf.8: 339-351.
Arsenic acid (H3AsO4), Disodium salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	11600	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Arsenic acid (H3AsO4), Disodium salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	7420	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Arsenic acid (H3AsO4), Disodium salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	7940	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Arsenic acid (H3AsO4), Disodium salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	21900	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Arsenic acid (H3AsO4), Disodium salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	15500	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Arsenic acid (H3AsO4), Disodium salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	15400	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Arsenic acid (H3AsO4), Disodium salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	73700	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Arsenic acid (H3AsO4), Disodium salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	63200	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Arsenic acid (H3AsO4), Disodium salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	54200	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Arsenic acid (H3AsO4), Disodium salt	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	256	NA	NR	ug/L	LAB	1980. Vocke, R.W., K.L. Sears, J.J. O'Toole, and R.B. Wildman. Growth Responses of Selected Freshwater Algae to Trace Elements and Scrubber Ash Slurry Generated by Coal-Fired Power Plants. Water Res.14(2): 141-150.
Arsenic acid (H3AsO4), Disodium salt	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	30761	NA	NR	ug/L	LAB	1980. Vocke, R.W., K.L. Sears, J.J. O'Toole, and R.B. Wildman. Growth Responses of Selected Freshwater Algae to Trace Elements and Scrubber Ash Slurry Generated by Coal-Fired Power Plants. Water Res.14(2): 141-150.
Arsenic acid (H3AsO4), Disodium salt	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	48	NA	NR	ug/L	LAB	1980. Vocke, R.W., K.L. Sears, J.J. O'Toole, and R.B. Wildman. Growth Responses of Selected Freshwater Algae to Trace Elements and Scrubber Ash Slurry Generated by Coal-Fired Power Plants. Water Res.14(2): 141-150.
Arsenic acid (H3AsO4), Monosodium salt	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	LOEC		T	NR	NR	NR	ug/L	LAB	2006. Mkandawire, M., B. Taubert, and E.G. Dudel. Limitations of Growth-Parameters in Lemna gibba Bioassays for Arsenic and Uranium Under Variable Phosphate Availability. Ecotoxicol. Environ. Saf.65(1): 118-128.
Arsenic acid (H3AsO4), Monosodium salt	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	NOEC		T	1000	NR	NR	ug/L	LAB	2006. Mkandawire, M., B. Taubert, and E.G. Dudel. Limitations of Growth-Parameters in Lemna gibba Bioassays for Arsenic and Uranium Under Variable Phosphate Availability. Ecotoxicol. Environ. Saf.65(1): 118-128.

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Table A-3. Summary of Results from the EcoTox Database for Plants - Barium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Barium	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	26000	NA	NR	ug/L	LAB	1986. Wang, W.. Toxicity Tests of Aquatic Pollutants by Using Common Duckweed. Environ. Pollut. Ser. B Chem. Phys.11(1): 1-14.
Barium chloride	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50*		T	25000	NA	NR	ug/L	LAB	1988. Wang, W.. Site-Specific Barium Toxicity to Common Duckweed, Lemna minor. Aquat. Toxicol.12(3): 203-212.
Barium chloride	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50*		T	NR	NA	NR	ug/L	LAB	1988. Wang, W.. Site-Specific Barium Toxicity to Common Duckweed, Lemna minor. Aquat. Toxicol.12(3): 203-212.

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Table A-4. Summary of Results from the EcoTox Database for Plants - Boron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Boron	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	60000	NA	NR	ug/L	LAB	1986. Wang, W.. Toxicity Tests of Aquatic Pollutants by Using Common Duckweed. Environ. Pollut. Ser. B Chem. Phys.11(1): 1-14.

Table A-5. Summary of Results from the EcoTox Database for Plants - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Blue-Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	15	NA	NR	ug/L	LAB	1980. Vocke, R.W., K.L. Sears, J.J. O'Toole, and R.B. Wildman. Growth Responses of Selected Freshwater Algae to Trace Elements and Scrubber Ash Slurry Generated by Coal-Fired Power Plants. Water Res.14(2): 141-150.
Cadmium chloride (CdCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	22	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cadmium chloride (CdCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	22	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cadmium chloride (CdCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	25	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cadmium chloride (CdCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	50	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cadmium chloride (CdCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	56	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cadmium chloride (CdCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	42	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cadmium	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	200	NA	NR	ug/L	LAB	1986. Wang, W.. Toxicity Tests of Aquatic Pollutants by Using Common Duckweed. Environ. Pollut. Ser. B Chem. Phys.11(1): 1-14.
Cadmium chloride (CdCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	241	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cadmium chloride (CdCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	323	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cadmium chloride (CdCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	110	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Sulfuric acid, Cadmium salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	3.5		NC	umol/L	LAB	2007. Drost, W., M. Matzke, and T. Backhaus. Heavy Metal Toxicity to Lemna minor: Studies on the Time Dependence of Growth Inhibition and the Recovery After Exposure. Chemosphere67(1): 36-43.
Sulfuric acid, Cadmium salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	4800		NC	nmol/g	LAB	2007. Drost, W., M. Matzke, and T. Backhaus. Heavy Metal Toxicity to Lemna minor: Studies on the Time Dependence of Growth Inhibition and the Recovery After Exposure. Chemosphere67(1): 36-43.
Sulfuric acid, Cadmium salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	1.9		NC	uM	LAB	2007. Drost, W., M. Matzke, and T. Backhaus. Heavy Metal Toxicity to Lemna minor: Studies on the Time Dependence of Growth Inhibition and the Recovery After Exposure. Chemosphere67(1): 36-43.
Cadmium	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	ER50		T	15.9	NR	NR	umol/g	LAB	1989. Smith, S., and M.K.H. Kwan. Use of Aquatic Macrophytes as a Bioassay Method to Assess Relative Toxicity, Uptake Kinetics and Accumulated Forms of Trace Metals. Hydrobiologia188-189: 345-351.
Cadmium	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	ER50		T	19	NR	NR	umol/g	LAB	1989. Smith, S., and M.K.H. Kwan. Use of Aquatic Macrophytes as a Bioassay Method to Assess Relative Toxicity, Uptake Kinetics and Accumulated Forms of Trace Metals. Hydrobiologia188-189: 345-351.
Sulfuric acid, Cadmium salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	IC25		T	40	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	IC50		T	150	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Cadmium	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	LOEC		T	9.4	NR	NR	umol/g	LAB	1989. Smith, S., and M.K.H. Kwan. Use of Aquatic Macrophytes as a Bioassay Method to Assess Relative Toxicity, Uptake Kinetics and Accumulated Forms of Trace Metals. Hydrobiologia188-189: 345-351.
Cadmium	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	LOEC		T	10.5	NR	NR	umol/g	LAB	1989. Smith, S., and M.K.H. Kwan. Use of Aquatic Macrophytes as a Bioassay Method to Assess Relative Toxicity, Uptake Kinetics and Accumulated Forms of Trace Metals. Hydrobiologia188-189: 345-351.
Sulfuric acid, Cadmium salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	LOEC		T	25	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	LOEC		T	25	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	NOEC		T	10	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	NOEC		T	10	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	5100	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.

Table A-5. Summary of Results from the EcoTox Database for Plants - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	4400	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	3700	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	110	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	14	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	28	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	30	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	31	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	46	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	80	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	50	NA	NR	ug/L	LAB	1986. Blaise, C., R. Legault, N. Bermingham, R. Van Coillie, and P. Vasseur. A Simple Microplate Algal Assay Technique for Aquatic Toxicity Assessment. Toxic. Assess.1: 261-281.
Nitric acid, Cadmium salt	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	50000	NA	NR	ug/L	LAB	1990. Wren, M.J., and D. McCarroll. A Simple and Sensitive Bioassay for the Detection of Toxic Materials Using a Unicellular Green Alga. Environ. Pollut.64(1): 87-91.
Sulfuric acid, Cadmium salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	19	NA	NR	ug/L	LAB	Freshwater Algae to Trace Elements and Scrubber Ash Slurry Generated by Coal-Fired Power Plants. Water Res.14(2): 141-150.
Sulfuric acid, Cadmium salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	19	NA	NR	ug/L	LAB	Freshwater Algae to Trace Elements and Scrubber Ash Slurry Generated by Coal-Fired Power Plants. Water Res.14(2): 141-150.
Sulfuric acid, Cadmium salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	5	NA	NR	ug/L	LAB	Freshwater Algae to Trace Elements and Scrubber Ash Slurry Generated by Coal-Fired Power Plants. Water Res.14(2): 141-150.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	LOEC		T	6		NC	ug/L	LAB	2007. Lin, K.C., Y.L. Lee, and C.Y. Chen. Metal Toxicity to Chlorella pyrenoidosa Assessed by a Short-Term Continuous Test. J. Hazard. Mater.142(1-2): 236-241.
Cadmium chloride (CdCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	NOEC		T	3		NC	ug/L	LAB	2007. Lin, K.C., Y.L. Lee, and C.Y. Chen. Metal Toxicity to Chlorella pyrenoidosa Assessed by a Short-Term Continuous Test. J. Hazard. Mater.142(1-2): 236-241.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	IC25		T	110	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	IC25		T	40	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	IC50		T	130	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	IC50		T	190	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	LOEC		T	75	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	LOEC		T	25	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	LOEC		T	25	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	LOEC		T	25	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	NOEC		T	10	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	NOEC		T	25	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	NOEC		T	10	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Sulfuric acid, Cadmium salt (1:1)	Inflated Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	NOEC		T	10	NR	NR	ug/L	LAB	2004. Sobrero, M.C., J. Beltrano, and A.E. Ronco. Comparative Response of Lemnaceae Clones to Copper(II), Chromium(VI), and Cadmium(II) Toxicity. Bull. Environ. Contam. Toxicol.73(2): 416-423.
Cadmium chloride (CdCl2)	Large Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	40*	NA	NR	ug/L	LAB	1987. Charpentier, S., J. Garnier, and R. Flaugnatti. Toxicity and Bioaccumulation of Cadmium in Experimental Cultures of Duckweed, Lemna polyrrhiza L. Bull. Environ. Contam. Toxicol.38(6): 1055-1061.

Table A-5. Summary of Results from the EcoTox Database for Plants - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Large Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	80*	NA	NR	ug/L	LAB	1987. Charpentier, S., J. Garnier, and R. Flaugnatti. Toxicity and Bioaccumulation of Cadmium in Experimental Cultures of Duckweed, Lemna polyrrhiza L. Bull. Environ. Contam. Toxicol.38(6): 1055-1061.
Cadmium chloride (CdCl2)	Large Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	50*	NA	NR	ug/L	LAB	1987. Charpentier, S., J. Garnier, and R. Flaugnatti. Toxicity and Bioaccumulation of Cadmium in Experimental Cultures of Duckweed, Lemna polyrrhiza L. Bull. Environ. Contam. Toxicol.38(6): 1055-1061.
Sulfuric acid, Cadmium salt (1:1)	Large Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	40*	NA	NR	ug/L	LAB	1987. Charpentier, S., J. Garnier, and R. Flaugnatti. Toxicity and Bioaccumulation of Cadmium in Experimental Cultures of Duckweed, Lemna polyrrhiza L. Bull. Environ. Contam. Toxicol.38(6): 1055-1061.
Sulfuric acid, Cadmium salt (1:1)	Large Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	100*	NA	NR	ug/L	LAB	1987. Charpentier, S., J. Garnier, and R. Flaugnatti. Toxicity and Bioaccumulation of Cadmium in Experimental Cultures of Duckweed, Lemna polyrrhiza L. Bull. Environ. Contam. Toxicol.38(6): 1055-1061.
Sulfuric acid, Cadmium salt (1:1)	Large Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	40*	NA	NR	ug/L	LAB	1987. Charpentier, S., J. Garnier, and R. Flaugnatti. Toxicity and Bioaccumulation of Cadmium in Experimental Cultures of Duckweed, Lemna polyrrhiza L. Bull. Environ. Contam. Toxicol.38(6): 1055-1061.
Cadmium chloride (CdCl2)	Large Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	eproductio	EC50		T	400*	NA	NR	ug/L	LAB	1987. Charpentier, S., J. Garnier, and R. Flaugnatti. Toxicity and Bioaccumulation of Cadmium in Experimental Cultures of Duckweed, Lemna polyrrhiza L. Bull. Environ. Contam. Toxicol.38(6): 1055-1061.
Sulfuric acid, Cadmium salt (1:1)	Large Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	eproductio	EC50		T	300*	NA	NR	ug/L	LAB	1987. Charpentier, S., J. Garnier, and R. Flaugnatti. Toxicity and Bioaccumulation of Cadmium in Experimental Cultures of Duckweed, Lemna polyrrhiza L. Bull. Environ. Contam. Toxicol.38(6): 1055-1061.

Table A-6. Summary of Results from the EcoTox Database for Plants - Cobalt

Chemical	Common Name	Class	Water Type	Scientific Name	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cobalt chloride (CoCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Spirulina platensis	Growth	EC50		T	23800	NA	NR	ug/L	LAB	1987. Sharma, R.M., S. Panigrahi, and P.A. Azeez. Effect of Cobalt on the Primary Productivity of Spirulina platensis. Bull. Environ. Contam. Toxicol.39(4): 716-720.
Cobalt chloride (CoCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Spirulina platensis	Growth	EC50		T	14400	NA	NR	ug/L	LAB	1987. Sharma, R.M., S. Panigrahi, and P.A. Azeez. Effect of Cobalt on the Primary Productivity of Spirulina platensis. Bull. Environ. Contam. Toxicol.39(4): 716-720.
Cobalt chloride (CoCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Spirulina platensis	Growth	EC50		T	10900	NA	NR	ug/L	LAB	1987. Sharma, R.M., S. Panigrahi, and P.A. Azeez. Effect of Cobalt on the Primary Productivity of Spirulina platensis. Bull. Environ. Contam. Toxicol.39(4): 716-720.
Cobalt chloride (CoCl2)	Blue-Green Algae	Algae, Moss, Fungi	Fresh	Spirulina platensis	Growth	EC50		T	8130	NA	NR	ug/L	LAB	1987. Sharma, R.M., S. Panigrahi, and P.A. Azeez. Effect of Cobalt on the Primary Productivity of Spirulina platensis. Bull. Environ. Contam. Toxicol.39(4): 716-720.
Cobalt chloride (CoCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Lemna minor	Growth	EC10		T	47	NA	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cobalt chloride (CoCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Lemna minor	Growth	EC10		T	52	NA	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cobalt chloride (CoCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Lemna minor	Growth	EC10		T	65	NA	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cobalt chloride (CoCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Lemna minor	Growth	EC20		T	110	NA	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cobalt chloride (CoCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Lemna minor	Growth	EC20		T	117	NA	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cobalt chloride (CoCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Lemna minor	Growth	EC20		T	97	NA	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cobalt chloride (CoCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Lemna minor	Growth	EC50		T	15700	NA	NR	ug/L	LAB	1999. Ince, N.H., N. Dirilgen, I.G. Apikyan, G. Tezcanli, and B. Ustun. Assessment of Toxic Interactions of Heavy Metals in Binary Mixtures: A Statistical Approach. Arch. Environ. Contam. Toxicol.36(4): 365-372.
Cobalt chloride (CoCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Lemna minor	Growth	EC50		T	542	NA	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cobalt chloride (CoCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Lemna minor	Growth	EC50		T	557	NA	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Cobalt chloride (CoCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Lemna minor	Growth	EC50		T	212	NA	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.

Table A-7. Summary of Results from the EcoTox Database for Plants - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Algae	Algae, Moss, Fungi	NR	Mortality	LC50	Not Reported	T	1980	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Algae	Algae, Moss, Fungi	NR	Mortality	LC50	Not Reported	T	31770	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Algae	Algae, Moss, Fungi	NR	Mortality	LC50		T	1980	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Algae	Algae, Moss, Fungi	NR	Mortality	LC50		T	31770	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Sulfuric acid copper(2+) salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
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Sulfuric acid copper(2+) salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Mortality	NR

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Sulfuric acid copper(2+) salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	1500	NA	NR	ug/L	LAB	1979. Filip, D.S., T. Peters, V.D. Adams, and E.J. Middlebrooks. Residual Heavy Metal Removal by an Algae-Intermittent Sand Filtration System. Water Res.13(3): 305-313.
Sulfuric acid copper(2+) salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	1500	NA	NR	ug/L	LAB	1979. Filip, D.S., T. Peters, V.D. Adams, and E.J. Middlebrooks. Residual Heavy Metal Removal by an Algae-Intermittent Sand Filtration System. Water Res.13(3): 305-313.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	LC50	Not Reported	D	10	NR	NR	uM	LAB	2008. Bhargava, P., A. Kumar, Y. Mishra, and L.C. Rai. Copper Pretreatment Augments Ultraviolet B Toxicity in the Cyanobacterium Anabaena doliolum: a Proteomic Analysis of Cell Death. Funct. Plant Biol.35(5): 360-372.
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Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1981. Pande, A.S., R. Sarkar, and K.P. Krishnamoorthi. Toxicity of Copper Sulphate to the Alga, Spirulina platensis, & the Ciliate Tetrahymena pyriformis. Indian J. Exp. Biol.19(5): 500-502.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	LC50	Not Reported	T	900	NA	NR	ug/L	LAB	1981. Pande, A.S., R. Sarkar, and K.P. Krishnamoorthi. Toxicity of Copper Sulphate to the Alga, Spirulina platensis, & the Ciliate Tetrahymena pyriformis. Indian J. Exp. Biol.19(5): 500-502.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1981. Pande, A.S., R. Sarkar, and K.P. Krishnamoorthi. Toxicity of Copper Sulphate to the Alga, Spirulina platensis, & the Ciliate Tetrahymena pyriformis. Indian J. Exp. Biol.19(5): 500-502.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	LC50		T	1300	NA	NR	ug/L	LAB	1981. Pande, A.S., R. Sarkar, and K.P. Krishnamoorthi. Toxicity of Copper Sulphate to the Alga, Spirulina platensis, & the Ciliate Tetrahymena pyriformis. Indian J. Exp. Biol.19(5): 500-502.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	LC50		T	900	NA	NR	ug/L	LAB	1981. Pande, A.S., R. Sarkar, and K.P. Krishnamoorthi. Toxicity of Copper Sulphate to the Alga, Spirulina platensis, & the Ciliate Tetrahymena pyriformis. Indian J. Exp. Biol.19(5): 500-502.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	LC50		T	700	NA	NR	ug/L	LAB	1981. Pande, A.S., R. Sarkar, and K.P. Krishnamoorthi. Toxicity of Copper Sulphate to the Alga, Spirulina platensis, & the Ciliate Tetrahymena pyriformis. Indian J. Exp. Biol.19(5): 500-502.
Copper chloride (CuCl)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	LC75	Not Reported	D	20	NR	NR	uM	LAB	2008. Bhargava, P., A. Kumar, Y. Mishra, and L.C. Rai. Copper Pretreatment Augments Ultraviolet B Toxicity in the Cyanobacterium Anabaena doliolum: a Proteomic Analysis of Cell Death. Funct. Plant Biol.35(5): 360-372.
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Copper chloride (CuCl2)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	LD25	Not Reported	T	4.8	NR	NR	umol/L	LAB	1998. Rai, L.C., B. Tyagi, P.K. Rai, and N. Mallick. Interactive Effects of UV-B and Heavy Metals (Cu and Pb) on Nitrogen and Phosphorus Metabolism of a N2-Fixing Cyanobacterium Anabaena doliolum. Environ. Exp. Bot.39(3): 221-231.
Copper chloride (CuCl2)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	LD25		T	4.8	NR	NR	umol/L	LAB	1998. Rai, L.C., B. Tyagi, P.K. Rai, and N. Mallick. Interactive Effects of UV-B and Heavy Metals (Cu and Pb) on Nitrogen and Phosphorus Metabolism of a N2-Fixing Cyanobacterium Anabaena doliolum. Environ. Exp. Bot.39(3): 221-231.
Copper chloride (CuCl2)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	LD50	Not Reported	T	8	NR	NR	umol/L	LAB	1998. Rai, L.C., B. Tyagi, P.K. Rai, and N. Mallick. Interactive Effects of UV-B and Heavy Metals (Cu and Pb) on Nitrogen and Phosphorus Metabolism of a N2-Fixing Cyanobacterium Anabaena doliolum. Environ. Exp. Bot.39(3): 221-231.
Copper chloride (CuCl2)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	LD50		T	8	NR	NR	umol/L	LAB	1998. Rai, L.C., B. Tyagi, P.K. Rai, and N. Mallick. Interactive Effects of UV-B and Heavy Metals (Cu and Pb) on Nitrogen and Phosphorus Metabolism of a N2-Fixing Cyanobacterium Anabaena doliolum. Environ. Exp. Bot.39(3): 221-231.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
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Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1980. Balagangadharan, B.R., K.M. Shankar, and T.J. Varghese. Use of Potassium Permanganate for Controlling Microcystis Bloom in Fish Ponds. In: M.Mohan Joseph (Ed.), Proceedings of the First Indian Fisheries Forum, Asian Fisheries Society, Indian Branch, Mangalore: 35-37.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	0.5	NR	NR	uM	LAB	1989. Gupta, S.L.. Interactive Effects of Nitrogen and Copper on Growth of Cyanobacterium Microcystis. Bull. Environ. Contam. Toxicol.42(2): 270-275.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	0.5	NR	NR	uM	LAB	1989. Gupta, S.L.. Interactive Effects of Nitrogen and Copper on Growth of Cyanobacterium Microcystis. Bull. Environ. Contam. Toxicol.42(2): 270-275.
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Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.

Table A-7. Summary of Results from the EcoTox Database for Plants - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NA	NR	ug/L	LAB	1980. Balagangadharan, B.R., K.M. Shankar, and T.J. Varghese. Use of Potassium Permanganate for Controlling Microcystis Bloom in Fish Ponds. In: M.Mohan Joseph (Ed.), Proceedings of the First Indian Fisheries Forum, Asian Fisheries Society, Indian Branch, Mangalore: 35-37.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	0.5	NR	NR	uM	LAB	1989. Gupta, S.L.. Interactive Effects of Nitrogen and Copper on Growth of Cyanobacterium Microcystis. Bull. Environ. Contam. Toxicol.42(2): 270-275.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	0.5	NR	NR	uM	LAB	1989. Gupta, S.L.. Interactive Effects of Nitrogen and Copper on Growth of Cyanobacterium Microcystis. Bull. Environ. Contam. Toxicol.42(2): 270-275.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	M	LAB	1985. Gupta, S.L., A.K. Kashyap, and A.P. Singh. Responses of Blue-Green Algae to Copper: A Comparative Study. Indian J. Environ. Health27(3): 224-229.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1972. Gibson, C.E.. The Algicidal Effect of Copper on a Green and a Blue-Green Alga and Some Ecological Implications. J. Appl. Ecol.9(2): 513-518.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	NR	Not Reported	T	50	NA	NR	ug/L	LAB	1972. Gibson, C.E.. The Algicidal Effect of Copper on a Green and a Blue-Green Alga and Some Ecological Implications. J. Appl. Ecol.9(2): 513-518.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	NR	Not Reported	T	50	NA	NR	ug/L	LAB	1972. Gibson, C.E.. The Algicidal Effect of Copper on a Green and a Blue-Green Alga and Some Ecological Implications. J. Appl. Ecol.9(2): 513-518.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	NR		T	100	NA	NR	ug/L	LAB	1972. Gibson, C.E.. The Algicidal Effect of Copper on a Green and a Blue-Green Alga and Some Ecological Implications. J. Appl. Ecol.9(2): 513-518.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	NR		T	50	NA	NR	ug/L	LAB	1972. Gibson, C.E.. The Algicidal Effect of Copper on a Green and a Blue-Green Alga and Some Ecological Implications. J. Appl. Ecol.9(2): 513-518.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	NR		T	50	NA	NR	ug/L	LAB	1972. Gibson, C.E.. The Algicidal Effect of Copper on a Green and a Blue-Green Alga and Some Ecological Implications. J. Appl. Ecol.9(2): 513-518.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	0.5	NR	NR	uM	LAB	1989. Gupta, S.L.. Interactive Effects of Nitrogen and Copper on Growth of Cyanobacterium Microcystis. Bull. Environ. Contam. Toxicol.42(2): 270-275.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	0.5	NR	NR	uM	LAB	1989. Gupta, S.L.. Interactive Effects of Nitrogen and Copper on Growth of Cyanobacterium Microcystis. Bull. Environ. Contam. Toxicol.42(2): 270-275.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	80*	NA	NR	ug/L	LAB	1952. Fitzgerald, G.P., G.C. Gerloff, and F. Skoog. Studies on Chemicals with Selective Toxicity to Blue-Green Algae. Sewage Ind. Wastes24(7): 888-896.
Sulfuric acid copper(2+) salt (1:1)	e-Green Alg	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	80*	NA	NR	ug/L	LAB	1952. Fitzgerald, G.P., G.C. Gerloff, and F. Skoog. Studies on Chemicals with Selective Toxicity to Blue-Green Algae. Sewage Ind. Wastes24(7): 888-896.
Sulfuric acid copper(2+) salt (1:1)	coid Green A	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	coid Green A	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Cryptomonad	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	56	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Cryptomonad	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	56	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Copper chloride (CuCl2)	Diatom	Algae, Moss, Fungi	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Patrick, R., J.,Jr. Cairns, and A. Scheier. The Relative Sensitivity of Diatoms, Snails, and Fish to Twenty Common Constituents of Industrial Wastes. Prog. Fish-Cult.30(3): 137-140.
Copper chloride (CuCl2)	Diatom	Algae, Moss, Fungi	Fresh	Mortality	LC50*		T	NR	NA	NR	ug/L	LAB	1968. Patrick, R., J.,Jr. Cairns, and A. Scheier. The Relative Sensitivity of Diatoms, Snails, and Fish to Twenty Common Constituents of Industrial Wastes. Prog. Fish-Cult.30(3): 137-140.

Table A-7. Summary of Results from the EcoTox Database for Plants - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Diatom	Algae, Moss, Fungi	NR	Mortality	NR	Not Reported	T	250	NA	NR	ug/L	LAB	1976. Braek, G.S., A. Jensen, and A. Mohus. Heavy Metal Tolerance of Marine Phytoplankton. III. Combined Effects of Copper and Zinc Ions on Cultures of Four Common Species. J. Exp. Mar. Biol. Ecol.25(1): 37-50.
Sulfuric acid copper(2+) salt (1:1)	Diatom	Algae, Moss, Fungi	NR	Mortality	NR		T	250	NA	NR	ug/L	LAB	1976. Braek, G.S., A. Jensen, and A. Mohus. Heavy Metal Tolerance of Marine Phytoplankton. III. Combined Effects of Copper and Zinc Ions on Cultures of Four Common Species. J. Exp. Mar. Biol. Ecol.25(1): 37-50.
Sulfuric acid copper(2+) salt (1:1)	Diatom	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	150	NA	NR	ug/L	LAB	1976. Braek, G.S., A. Jensen, and A. Mohus. Heavy Metal Tolerance of Marine Phytoplankton. III. Combined Effects of Copper and Zinc Ions on Cultures of Four Common Species. J. Exp. Mar. Biol. Ecol.25(1): 37-50.
Sulfuric acid copper(2+) salt (1:1)	Diatom	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	200	NA	NR	ug/L	LAB	1976. Braek, G.S., A. Jensen, and A. Mohus. Heavy Metal Tolerance of Marine Phytoplankton. III. Combined Effects of Copper and Zinc Ions on Cultures of Four Common Species. J. Exp. Mar. Biol. Ecol.25(1): 37-50.
Sulfuric acid copper(2+) salt (1:1)	Diatom	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	150	NA	NR	ug/L	LAB	1976. Braek, G.S., A. Jensen, and A. Mohus. Heavy Metal Tolerance of Marine Phytoplankton. III. Combined Effects of Copper and Zinc Ions on Cultures of Four Common Species. J. Exp. Mar. Biol. Ecol.25(1): 37-50.
Sulfuric acid copper(2+) salt (1:1)	Diatom	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	200	NA	NR	ug/L	LAB	1976. Braek, G.S., A. Jensen, and A. Mohus. Heavy Metal Tolerance of Marine Phytoplankton. III. Combined Effects of Copper and Zinc Ions on Cultures of Four Common Species. J. Exp. Mar. Biol. Ecol.25(1): 37-50.
Carbonic acid, Copper(2+) salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Quick, T., and N.F. Cardarelli. Environmental Impact of Controlled Release Molluscicides and Their Degradation Products: A Preliminary Report. In: H.B.Scher (Ed.), Proc.Int.Controlled Release Pestic.Symp., ACS Symp.Ser.No.53, Washington, D.C.: 90-104.
Carbonic acid, Copper(2+) salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1977. Quick, T., and N.F. Cardarelli. Environmental Impact of Controlled Release Molluscicides and Their Degradation Products: A Preliminary Report. In: H.B.Scher (Ed.), Proc.Int.Controlled Release Pestic.Symp., ACS Symp.Ser.No.53, Washington, D.C.: 90-104.
Sulfuric acid copper(2+) salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR	Not Reported	T	130	NA	NR	ug/L	LAB	1979. Brown, B.T., and B.M. Rattigan. Toxicity of Soluble Copper and Other Metal Ions to Elodea canadensis. Environ. Pollut.20(4): 303-314.
Sulfuric acid copper(2+) salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR	Not Reported	T	1200*	NA	NR	ug/L	LAB	1974. Nishiuchi, Y.. Control Effect of Pesticide to Duckweed. Bull.Agric.Chem.Insp.Stn.(Tokyo)14: 69-72.
Sulfuric acid copper(2+) salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR		T	130	NA	NR	ug/L	LAB	1979. Brown, B.T., and B.M. Rattigan. Toxicity of Soluble Copper and Other Metal Ions to Elodea canadensis. Environ. Pollut.20(4): 303-314.
Sulfuric acid copper(2+) salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR		T	1200*	NA	NR	ug/L	LAB	1974. Nishiuchi, Y.. Control Effect of Pesticide to Duckweed. Bull.Agric.Chem.Insp.Stn.(Tokyo)14: 69-72.
Carbonic acid, Copper(2+) salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	LAB	1977. Quick, T., and N.F. Cardarelli. Environmental Impact of Controlled Release Molluscicides and Their Degradation Products: A Preliminary Report. In: H.B.Scher (Ed.), Proc.Int.Controlled Release Pestic.Symp., ACS Symp.Ser.No.53, Washington, D.C.: 90-104.
Carbonic acid, Copper(2+) salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR-LETH		T	10000	NR	NR	ug/L	LAB	1977. Quick, T., and N.F. Cardarelli. Environmental Impact of Controlled Release Molluscicides and Their Degradation Products: A Preliminary Report. In: H.B.Scher (Ed.), Proc.Int.Controlled Release Pestic.Symp., ACS Symp.Ser.No.53, Washington, D.C.: 90-104.
Sulfuric acid copper(2+) salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR-LETH		T	5000	NR	NR	ug/L	LAB	1988. Eloranta, P., T. Lahtinen, and H. Salonen. Effects of Some Environmental Factors on the Pigments of Duckweed (Lemna minor L.). Aqua Fenn.18(1): 75-84.
Sulfuric acid copper(2+) salt (1:1)	Euglenoid	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Euglenoid	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	150	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	180	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	220	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	240	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	250	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	260	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	280	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	280	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	300	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	350	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	350	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	150	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	180	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	220	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	240	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	250	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	260	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	280	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	280	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	300	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	350	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	350	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ntous Green	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ellate Eugle	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	ellate Eugle	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	ellate Eugle	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	ellate Eugle	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	ellate Eugle	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	1000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	ellate Eugle	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	NR	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Green Alga	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Alga	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50	Not Reported	T	76.9	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50	Not Reported	T	91.4	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50	Not Reported	T	91.8	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50	Not Reported	T	62.3	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.

Table A-7. Summary of Results from the EcoTox Database for Plants - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50	Not Reported	T	61.7	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50	Not Reported	T	62.7	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50		T	76.9	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50		T	91.4	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50		T	91.8	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50		T	62.3	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50		T	61.7	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.
Copper	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50		T	62.7	NA	NR	ug/L	LAB	1987. Balasubrahmanyam, L., T.K. Ghosh, and K.P. Krishnamoorthi. Safe Level of Copper to Freshwater Alga Scenedesmus. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.53(2): 177-182.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50	Not Reported	T	1980	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50	Not Reported	T	31770	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50	Not Reported	T	15880	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50	Not Reported	T	1980	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50	Not Reported	T	15880	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50	Not Reported	T	64510	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50		T	1980	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50		T	31770	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50		T	15880	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50		T	1980	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50		T	15880	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	NR	Mortality	LC50		T	64510	NR	NR	ug/L	LAB	1983. Aliotta, G., G. Pinto, and A. Pollio. Observations on Tolerance to Heavy Metals of Four Green Algae in Relation to pH. Giorn. Bot. Ital. 117(5/6): 247-251.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50	Not Reported	T	5	NR	NR	uM	LAB	2008. Zhang, L.P., S.K. Mehta, Z.P. Liu, and Z.M. Yang. Copper-Induced Proline Synthesis is Associated with Nitric Oxide Generation in Chlamydomonas reinhardtii. Plant Cell Physiol.49(3): 411-419.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	LC50		T	5	NR	NR	uM	LAB	2008. Zhang, L.P., S.K. Mehta, Z.P. Liu, and Z.M. Yang. Copper-Induced Proline Synthesis is Associated with Nitric Oxide Generation in Chlamydomonas reinhardtii. Plant Cell Physiol.49(3): 411-419.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Angadi, S.B., and P. Mathad. Effect of Copper, Cadmium and Mercury on the Morphological, Physiological and Biochemical Characteristics of Scenedesmus quadricauda (Turp.) de Breb. J. Environ. Biol.19(2): 119-124.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1998. Angadi, S.B., and P. Mathad. Effect of Copper, Cadmium and Mercury on the Morphological, Physiological and Biochemical Characteristics of Scenedesmus quadricauda (Turp.) de Breb. J. Environ. Biol.19(2): 119-124.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.

Table A-7. Summary of Results from the EcoTox Database for Plants - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Ludyanskiy, M.L., M.V. Maslov, and A.P. Pasichnyy. Effect of Temperature on Algicidal Properties of Copper Sulfate. Hydrobiol. J.26(5): 80-83.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	40000	NA	NR	ug/L	LAB	1987. Pekkala, C.M., and B. Koopman. Effect of Toxicants on Algal Sinking Rates. Water Air Soil Pollut.36: 155-162.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
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Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.

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Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NA	NR	ug/L	LAB	1990. Ludyanskiy, M.L., M.V. Maslov, and A.P. Pasichnyy. Effect of Temperature on Algicidal Properties of Copper Sulfate. Hydrobiol. J.26(5): 80-83.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	40000	NA	NR	ug/L	LAB	1987. Pekkala, C.M., and B. Koopman. Effect of Toxicants on Algal Sinking Rates. Water Air Soil Pollut.36: 155-162.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Copper chloride (CuCl)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	0.00021	L	3.4E-05	mol/L	LAB	2009. Sabatini, S.E., A.B. Juarez, M.R. Eppis, L. Bianchi, C.M. Luquet, and M.D.C. Rios de Molina. Oxidative Stress and Antioxidant Defenses in Two Green Microalgae Exposed to Copper. Ecotoxicol. Environ. Saf.72(4): 1200-1206.
Copper chloride (CuCl)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	0.00021	L	3.4E-05	mol/L	LAB	2009. Sabatini, S.E., A.B. Juarez, M.R. Eppis, L. Bianchi, C.M. Luquet, and M.D.C. Rios de Molina. Oxidative Stress and Antioxidant Defenses in Two Green Microalgae Exposed to Copper. Ecotoxicol. Environ. Saf.72(4): 1200-1206.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	300	NA	NR	ug/L	LAB	1974. Bartlett, L., F.W. Rabe, and W.H. Funk. Effects of Copper, Zinc and Cadmium on Selanastrum capricornutum. Water Res.8(3): 179-185.
Copper chloride (CuCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	300	NA	NR	ug/L	LAB	1974. Bartlett, L., F.W. Rabe, and W.H. Funk. Effects of Copper, Zinc and Cadmium on Selanastrum capricornutum. Water Res.8(3): 179-185.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	300	NA	NR	ug/L	LAB	1975. Hutchinson, T.C., and P.M. Stokes. Heavy Metal Toxicity and Algal Bioassays. In: Symp.on Water Quality Parameters-Selection, Measurement, and Monitoring, ASTM STP 573, Philadelphia, PA: 320-343.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	56000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	56000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	20000	NR	NR	ug/L	LAB	1963. Fitzgerald, G.P., and S.L. Faust. Bioassay for Algicidal vs. Algistatic Chemicals. Water Sewage Works: 296-298.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	20000	NR	NR	ug/L	LAB	1963. Fitzgerald, G.P., and S.L. Faust. Bioassay for Algicidal vs. Algistatic Chemicals. Water Sewage Works: 296-298.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	300	NA	NR	ug/L	LAB	1975. Hutchinson, T.C., and P.M. Stokes. Heavy Metal Toxicity and Algal Bioassays. In: Symp.on Water Quality Parameters-Selection, Measurement, and Monitoring, ASTM STP 573, Philadelphia, PA: 320-343.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH	Not Reported	T	700	NA	NR	ug/L	LAB	1975. Hutchinson, T.C., and P.M. Stokes. Heavy Metal Toxicity and Algal Bioassays. In: Symp.on Water Quality Parameters-Selection, Measurement, and Monitoring, ASTM STP 573, Philadelphia, PA: 320-343.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	300	NA	NR	ug/L	LAB	1975. Hutchinson, T.C., and P.M. Stokes. Heavy Metal Toxicity and Algal Bioassays. In: Symp.on Water Quality Parameters-Selection, Measurement, and Monitoring, ASTM STP 573, Philadelphia, PA: 320-343.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	56000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	56000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	20000	NR	NR	ug/L	LAB	1963. Fitzgerald, G.P., and S.L. Faust. Bioassay for Algicidal vs. Algistatic Chemicals. Water Sewage Works: 296-298.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	20000	NR	NR	ug/L	LAB	1963. Fitzgerald, G.P., and S.L. Faust. Bioassay for Algicidal vs. Algistatic Chemicals. Water Sewage Works: 296-298.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	300	NA	NR	ug/L	LAB	1975. Hutchinson, T.C., and P.M. Stokes. Heavy Metal Toxicity and Algal Bioassays. In: Symp.on Water Quality Parameters-Selection, Measurement, and Monitoring, ASTM STP 573, Philadelphia, PA: 320-343.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Mortality	NR-LETH		T	700	NA	NR	ug/L	LAB	1975. Hutchinson, T.C., and P.M. Stokes. Heavy Metal Toxicity and Algal Bioassays. In: Symp.on Water Quality Parameters-Selection, Measurement, and Monitoring, ASTM STP 573, Philadelphia, PA: 320-343.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	100	NA	NR	ug/L	LAB	1973. Hutchinson, T.C.. Comparative Studies of the Toxicity of Heavy Metals to Phytoplankton and Their Synergistic Interactions. Water Pollut. Res. Can.8: 68-90.

Table A-7. Summary of Results from the EcoTox Database for Plants - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	300	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	400	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	300	NA	NR	ug/L	LAB	1973. Hutchinson, T.C.. Comparative Studies of the Toxicity of Heavy Metals to Phytoplankton and Their Synergistic Interactions. Water Pollut. Res. Can.8: 68-90.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	430	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	470	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	290	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	550	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	180	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	220	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	380	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	420	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	420	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	600	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	650	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	700	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	650	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	13000*	NA	NR	ug/L	LAB	1979. Rao, V.N.R., and P.J. Manohar. Effect of Some Antialgal Chemicals on Growth of Stigeoclonium tenue Kutz. in Laboratory Cultures. Proc. Indian Acad. Sci. Sect. B88(5, Pt. 2): 367-372.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	380	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	270	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	530	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH	Not Reported	T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	100	NA	NR	ug/L	LAB	1973. Hutchinson, T.C.. Comparative Studies of the Toxicity of Heavy Metals to Phytoplankton and Their Synergistic Interactions. Water Pollut. Res. Can.8: 68-90.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	300	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.

Table A-7. Summary of Results from the EcoTox Database for Plants - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	400	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	1000	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	300	NA	NR	ug/L	LAB	1973. Hutchinson, T.C.. Comparative Studies of the Toxicity of Heavy Metals to Phytoplankton and Their Synergistic Interactions. Water Pollut. Res. Can.8: 68-90.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	430	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	470	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	290	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	550	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	180	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	220	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	380	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	420	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	420	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	600	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	650	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	700	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	650	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	13000*	NA	NR	ug/L	LAB	1979. Rao, V.N.R., and P.J. Manohar. Effect of Some Antialgal Chemicals on Growth of Stigeoclonium tenue Kutz. in Laboratory Cultures. Proc. Indian Acad. Sci. Sect. B88(5, Pt. 2): 367-372.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	380	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	270	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	500	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	530	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	Green Algae	Algae, Moss, Fungi	NR	Mortality	NR-LETH		T	450	NA	NR	ug/L	LAB	1970. Whitton, B.A.. Toxicity of Zinc, Copper and Lead to Chlorophyta from Flowing Waters. Arch. Microbiol.72: 353-360.
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	10460	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	3670	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..

Table A-7. Summary of Results from the EcoTox Database for Plants - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	6250	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	8840	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	12490	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	14280	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	15000	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	6840	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	7030	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	7620	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..

Table A-7. Summary of Results from the EcoTox Database for Plants - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	8000	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	10460	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	3670	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	6250	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	8840	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	10000	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	10000	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	10000	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..

Table A-7. Summary of Results from the EcoTox Database for Plants - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	10000	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	12000	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	12000	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	8000	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	12490	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	14280	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	15000	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	6840	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	7030	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	7620	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..

Table A-7. Summary of Results from the EcoTox Database for Plants - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	ated Duckw	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	LC50		T	NR	NR	NR	ug/L	LAB	1981. Davis, J.A.. Comparison of Static-Replacement and Flow-Through Bioassays Using Duckweed, Lemna gibba G-3. EPA 560/6-81-003, U.S.EPA, Washington, DC: 106 p..
Sulfuric acid copper(2+) salt (1:1)	rge Duckwe	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	EC50		T	200		NC	ug/L	LAB	2002. Saadi, A., M. Guerbet, and J. Garnier. Influence of Diethyldithiocarbamate on Cadmium and Copper Toxicity to Freshwater Macrophyte Spirodela polyrhiza. Water SA28(1): 107-110.
Sulfuric acid copper(2+) salt (1:1)	rge Duckwe	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	EC50		T	400		NC	ug/L	LAB	2002. Saadi, A., M. Guerbet, and J. Garnier. Influence of Diethyldithiocarbamate on Cadmium and Copper Toxicity to Freshwater Macrophyte Spirodela polyrhiza. Water SA28(1): 107-110.
Sulfuric acid copper(2+) salt (1:1)	Celery, Tap	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Quick, T., and N.F. Cardarelli. Environmental Impact of Controlled Release Molluscicides and Their Degradation Products: A Preliminary Report. In: H.B.Scher (Ed.), Proc.Int.Controlled Release Pestic.Symp., ACS Symp.Ser.No.53, Washington, D.C.: 90-104.
Sulfuric acid copper(2+) salt (1:1)	Celery, Tap	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1977. Quick, T., and N.F. Cardarelli. Environmental Impact of Controlled Release Molluscicides and Their Degradation Products: A Preliminary Report. In: H.B.Scher (Ed.), Proc.Int.Controlled Release Pestic.Symp., ACS Symp.Ser.No.53, Washington, D.C.: 90-104.
Carbonic acid, Copper(2+) salt (1:1)	Waterweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Quick, T., and N.F. Cardarelli. Environmental Impact of Controlled Release Molluscicides and Their Degradation Products: A Preliminary Report. In: H.B.Scher (Ed.), Proc.Int.Controlled Release Pestic.Symp., ACS Symp.Ser.No.53, Washington, D.C.: 90-104.
Carbonic acid, Copper(2+) salt (1:1)	Waterweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1977. Quick, T., and N.F. Cardarelli. Environmental Impact of Controlled Release Molluscicides and Their Degradation Products: A Preliminary Report. In: H.B.Scher (Ed.), Proc.Int.Controlled Release Pestic.Symp., ACS Symp.Ser.No.53, Washington, D.C.: 90-104.
Sulfuric acid copper(2+) salt (1:1)	Waterweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Quick, T., and N.F. Cardarelli. Environmental Impact of Controlled Release Molluscicides and Their Degradation Products: A Preliminary Report. In: H.B.Scher (Ed.), Proc.Int.Controlled Release Pestic.Symp., ACS Symp.Ser.No.53, Washington, D.C.: 90-104.
Sulfuric acid copper(2+) salt (1:1)	Waterweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR	Not Reported	T	3100	NA	NR	ug/L	LAB	1979. Brown, B.T., and B.M. Rattigan. Toxicity of Soluble Copper and Other Metal Ions to Elodea canadensis. Environ. Pollut.20(4): 303-314.
Sulfuric acid copper(2+) salt (1:1)	Waterweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR		T	NR	NR	NR	ug/L	LAB	1977. Quick, T., and N.F. Cardarelli. Environmental Impact of Controlled Release Molluscicides and Their Degradation Products: A Preliminary Report. In: H.B.Scher (Ed.), Proc.Int.Controlled Release Pestic.Symp., ACS Symp.Ser.No.53, Washington, D.C.: 90-104.
Sulfuric acid copper(2+) salt (1:1)	Waterweed	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR		T	3100	NA	NR	ug/L	LAB	1979. Brown, B.T., and B.M. Rattigan. Toxicity of Soluble Copper and Other Metal Ions to Elodea canadensis. Environ. Pollut.20(4): 303-314.
Sulfuric acid copper(2+) salt (1:1)	rweed, Ditch	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	umol/L	LAB	1982. Van der Werff, M., and M.J. Pruyt. Long-Term Effects of Heavy Metals on Aquatic Plants. Chemosphere11(8): 727-739.
Sulfuric acid copper(2+) salt (1:1)	rweed, Ditch	Flowers, Trees, Shrubs, Ferns	Fresh	Mortality	NR		T	100	NR	NR	umol/L	LAB	1982. Van der Werff, M., and M.J. Pruyt. Long-Term Effects of Heavy Metals on Aquatic Plants. Chemosphere11(8): 727-739.

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Table A-8. Summary of Results from the EcoTox Database for Plants - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	3700	NA	NR	ug/L	LAB	1986. Wang, W.. Toxicity Tests of Aquatic Pollutants by Using Common Duckweed. Environ. Pollut. Ser. B Chem. Phys.11(1): 1-14.

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Table A-9. Summary of Results from the EcoTox Database for Plants - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	8000	NA	NR	ug/L	LAB	1986. Wang, W.. Toxicity Tests of Aquatic Pollutants by Using Common Duckweed. Environ. Pollut. Ser. B Chem. Phys.11(1): 1-14.

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Table A-10. Summary of Results from the EcoTox Database for Plants - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Manganese	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	31000	NA	NR	ug/L	LAB	1986. Wang, W.. Toxicity Tests of Aquatic Pollutants by Using Common Duckweed. Environ. Pollut. Ser. B Chem. Phys.11(1): 1-14.

Table A-11. Summary of Results from the EcoTox Database for Plants - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Algae	Algae, Moss, Fungi	NR	Growth	EC100		T	400*	NA	NR	ug/L	LAB	1984. Blanck, H., G. Wallin, and S.A. Wangberg. Species-Dependent Variation in Algal Sensitivity to Chemical Compounds. Ecotoxicol. Environ. Saf.8: 339-351.
Mercury chloride (HgCl2)	Blue-Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	53.2*	NA	NR	ug/L	LAB	1978. Thomas, D.L., and J.G. Montes. Spectrophotometrically Assayed Inhibitory Effects of Mercuric Compounds on Anabaena flos-aquae and Anacystis nidulans (Cyanophyceae). J. Phycol.14(4): 494-499.
Mercury chloride (HgCl2)	Blue-Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	107.1*	NA	NR	ug/L	LAB	1978. Thomas, D.L., and J.G. Montes. Spectrophotometrically Assayed Inhibitory Effects of Mercuric Compounds on Anabaena flos-aquae and Anacystis nidulans (Cyanophyceae). J. Phycol.14(4): 494-499.
Sulfuric acid, Mercury(2+) salt(1:1)	Blue-Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	253	NA	NR	ug/L	LAB	1980. Vocke, R.W., K.L. Sears, J.J. O'Toole, and R.B. Wildman. Growth Responses of Selected Freshwater Algae to Trace Elements and Scrubber Ash Slurry Generated by Coal-Fired Power Plants. Water Res.14(2): 141-150.
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	21	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	29	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	26	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	47	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	86	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	52	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	221	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	683	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	191	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant
Sulfuric acid, Mercury(2+) salt(1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	78	NA	NR	ug/L	LAB	1980. Vocke, R.W., K.L. Sears, J.J. O'Toole, and R.B. Wildman. Growth Responses of Selected Freshwater Algae to Trace Elements and Scrubber Ash Slurry Generated by Coal-Fired Power Plants. Water Res.14(2): 141-150.
Sulfuric acid, Mercury(2+) salt(1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	33	NA	NR	ug/L	LAB	1980. Vocke, R.W., K.L. Sears, J.J. O'Toole, and R.B. Wildman. Growth Responses of Selected Freshwater Algae to Trace Elements and Scrubber Ash Slurry Generated by Coal-Fired Power Plants. Water Res.14(2): 141-150.
Sulfuric acid, Mercury(2+) salt(1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	85	NA	NR	ug/L	LAB	1980. Vocke, R.W., K.L. Sears, J.J. O'Toole, and R.B. Wildman. Growth Responses of Selected Freshwater Algae to Trace Elements and Scrubber Ash Slurry Generated by Coal-Fired Power Plants. Water Res.14(2): 141-150.

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Table A-12. Summary of Results from the EcoTox Database for Plants - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	81	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	34	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	74	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	166	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	78	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	130	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nickel	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	450	NA	NR	ug/L	LAB	1986. Wang, W.. Toxicity Tests of Aquatic Pollutants by Using Common Duckweed. Environ. Pollut. Ser. B Chem. Phys.11(1): 1-14.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	655	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	370	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	384	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Sulfuric acid, Nickel(2+)salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	5300		NC	nmol/g	LAB	2007. Drost, W., M. Matzke, and T. Backhaus. Heavy Metal Toxicity to Lemna minor: Studies on the Time Dependence of Growth Inhibition and the Recovery After Exposure. Chemosphere67(1): 36-43.
Sulfuric acid, Nickel(2+)salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	81.8		NC	umol/g	LAB	2007. Drost, W., M. Matzke, and T. Backhaus. Heavy Metal Toxicity to Lemna minor: Studies on the Time Dependence of Growth Inhibition and the Recovery After Exposure. Chemosphere67(1): 36-43.
Sulfuric acid, Nickel(2+)salt (1:1)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	56.3		NC	uM	LAB	2007. Drost, W., M. Matzke, and T. Backhaus. Heavy Metal Toxicity to Lemna minor: Studies on the Time Dependence of Growth Inhibition and the Recovery After Exposure. Chemosphere67(1): 36-43.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50*		T	210	NA	NR	ug/L	LAB	1987. Wang, W.. Toxicity of Nickel to Common Duckweed (Lemna minor). Environ. Toxicol. Chem.6(12): 961-967.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50*		T	3100	NA	NR	ug/L	LAB	1987. Wang, W.. Toxicity of Nickel to Common Duckweed (Lemna minor). Environ. Toxicol. Chem.6(12): 961-967.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50*		T	330	NA	NR	ug/L	LAB	1987. Wang, W.. Toxicity of Nickel to Common Duckweed (Lemna minor). Environ. Toxicol. Chem.6(12): 961-967.
Nickel chloride (NiCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50*		T	360	NA	NR	ug/L	LAB	1987. Wang, W.. Toxicity of Nickel to Common Duckweed (Lemna minor). Environ. Toxicol. Chem.6(12): 961-967.
Nickel chloride (NiCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	NR	NA	NR	ug/L	LAB	1986. Blaise, C., R. Legault, N. Bermingham, R. Van Coillie, and P. Vasseur. A Simple Microplate Algal Assay Technique for Aquatic Toxicity Assessment. Toxic. Assess.1: 261-281.

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Table A-13. Summary of Results from the EcoTox Database for Plants - Selenium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Selenium	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	2400	NA	NR	ug/L	LAB	1986. Wang, W.. Toxicity Tests of Aquatic Pollutants by Using Common Duckweed. Environ. Pollut. Ser. B Chem. Phys.11(1): 1-14.
Selenium	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	143000	NA	NR	ug/L	LAB	1990. Ibrahim, A.M., and A. Spacie. Toxicity of Inorganic Selenium to the Green Alga Selenastrum capricornutum Printz. Environ. Exp. Bot.30(3): 265-269.
Selenium	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	100000	NA	NR	ug/L	LAB	1990. Ibrahim, A.M., and A. Spacie. Toxicity of Inorganic Selenium to the Green Alga Selenastrum capricornutum Printz. Environ. Exp. Bot.30(3): 265-269.
Selenium	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	99000	NA	NR	ug/L	LAB	1990. Ibrahim, A.M., and A. Spacie. Toxicity of Inorganic Selenium to the Green Alga Selenastrum capricornutum Printz. Environ. Exp. Bot.30(3): 265-269.
Selenium	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	96000	NA	NR	ug/L	LAB	1990. Ibrahim, A.M., and A. Spacie. Toxicity of Inorganic Selenium to the Green Alga Selenastrum capricornutum Printz. Environ. Exp. Bot.30(3): 265-269.
Selenium	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	75000	NA	NR	ug/L	LAB	1990. Ibrahim, A.M., and A. Spacie. Toxicity of Inorganic Selenium to the Green Alga Selenastrum capricornutum Printz. Environ. Exp. Bot.30(3): 265-269.
Selenium	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	65000	NA	NR	ug/L	LAB	1990. Ibrahim, A.M., and A. Spacie. Toxicity of Inorganic Selenium to the Green Alga Selenastrum capricornutum Printz. Environ. Exp. Bot.30(3): 265-269.

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Table A-14. Summary of Results from the EcoTox Database for Plants - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	7	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nitric acid, silver (1+) salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	6	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nitric acid, silver (1+) salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	7	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nitric acid, silver (1+) salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	12	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nitric acid, silver (1+) salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	16	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nitric acid, silver (1+) salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	12	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nitric acid, silver (1+) salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	31	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nitric acid, silver (1+) salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	81	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Nitric acid, silver (1+) salt	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	30	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.

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Table A-15. Summary of Results from the EcoTox Database for Plants - Thallium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Thallous(I) nitrate	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	153	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Thallous(I) nitrate	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	142	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Thallous(I) nitrate	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	114	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Thallous(I) nitrate	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	201	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Thallous(I) nitrate	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	202	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Thallous(I) nitrate	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	150	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Thallous(I) nitrate	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	338	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Thallous(I) nitrate	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	397	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Thallous(I) nitrate	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	251	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Thallium	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	ER50		T	2.18	NR	NR	umol/g	LAB	1989. Smith, S., and M.K.H. Kwan. Use of Aquatic Macrophytes as a Bioassay Method to Assess Relative Toxicity, Uptake Kinetics and Accumulated Forms of Trace Metals. Hydrobiologia188-189: 345-351.
Thallium	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	ER50		T	2.5	NR	NR	umol/g	LAB	1989. Smith, S., and M.K.H. Kwan. Use of Aquatic Macrophytes as a Bioassay Method to Assess Relative Toxicity, Uptake Kinetics and Accumulated Forms of Trace Metals. Hydrobiologia188-189: 345-351.
Thallium	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	LOEC		T	0.96	NR	NR	umol/g	LAB	1989. Smith, S., and M.K.H. Kwan. Use of Aquatic Macrophytes as a Bioassay Method to Assess Relative Toxicity, Uptake Kinetics and Accumulated Forms of Trace Metals. Hydrobiologia188-189: 345-351.
Thallium	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	LOEC		T	1.38	NR	NR	umol/g	LAB	1989. Smith, S., and M.K.H. Kwan. Use of Aquatic Macrophytes as a Bioassay Method to Assess Relative Toxicity, Uptake Kinetics and Accumulated Forms of Trace Metals. Hydrobiologia188-189: 345-351.

Table A-16. Summary of Results from the EcoTox Database for Plants - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	10200		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	3860		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	5200		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	7200		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	740		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	750		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	7620		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	8150		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	9000		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1090		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1120		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	12700		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1460		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1460		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1730		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	3740		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	3990		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	5300		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	700		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	7000		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	880		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	10000		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	10200		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	10500		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	10500		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	10500		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1060		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	10600		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1120		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1140		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	11900		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1200		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.

Table A-16. Summary of Results from the EcoTox Database for Plants - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1200		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1230		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1230		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1250		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	12500		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	13700		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	14700		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1500		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	1700		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	18500		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	2190		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	220		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	2590		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	2640		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	30500		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	3240		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	3240		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	4140		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	4240		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	4240		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	4300		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	4680		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	4680		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	4730		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	5050		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	530		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	5480		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	6050		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	6750		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	7240		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	890		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	8940		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.

Table A-16. Summary of Results from the EcoTox Database for Plants - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	900		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	910		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Sulfuric acid, Zinc salt (1:1)	Algae	Algae, Moss, Fungi	Fresh	Growth	MATC		T	920		NC	ug/L	LAB	1977. Say, P.J., B.M. Diaz, and B.A. Whitton. Influence of Zinc on Lotic Plants. I. Tolerance of Hormidium Species to Zinc. Freshw. Biol.7: 357-376.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	8	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	17	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	49	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	44	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	68	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	108	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Zinc	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	10000	NA	NR	ug/L	LAB	1986. Wang, W.. Toxicity Tests of Aquatic Pollutants by Using Common Duckweed. Environ. Pollut. Ser. B Chem. Phys.11(1): 1-14.
Zinc	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	14	NA	NR	uM	LAB	1992. Huebert, D.B., and J.M. Shay. Zinc Toxicity and Its Interaction with Cadmium in the Submerged Aquatic Macrophyte Lemna trisulca L. Environ. Toxicol. Chem.11(5): 715-720.
Zinc	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	5	NA	NR	uM	LAB	1992. Huebert, D.B., and J.M. Shay. Zinc Toxicity and Its Interaction with Cadmium in the Submerged Aquatic Macrophyte Lemna trisulca L. Environ. Toxicol. Chem.11(5): 715-720.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	9600		NC	ug/L	LAB	1999. Ince, N.H., N. Dirilgen, I.G. Apikyan, G. Tezcanli, and B. Ustun. Assessment of Toxic Interactions of Heavy Metals in Binary Mixtures: A Statistical Approach. Arch. Environ. Contam. Toxicol.36(4): 365-372.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	1026.4		NC	umol/L	LAB	2007. Drost, W., M. Matzke, and T. Backhaus. Heavy Metal Toxicity to Lemna minor: Studies on the Time Dependence of Growth Inhibition and the Recovery After Exposure. Chemosphere67(1): 36-43.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	105200		NC	nmol/g	LAB	2007. Drost, W., M. Matzke, and T. Backhaus. Heavy Metal Toxicity to Lemna minor: Studies on the Time Dependence of Growth Inhibition and the Recovery After Exposure. Chemosphere67(1): 36-43.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	46.1		NC	uM	LAB	2007. Drost, W., M. Matzke, and T. Backhaus. Heavy Metal Toxicity to Lemna minor: Studies on the Time Dependence of Growth Inhibition and the Recovery After Exposure. Chemosphere67(1): 36-43.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	1050	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	909	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Zinc chloride (ZnCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	486	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC20		T	10	NR	NR	ug/L	LAB	2009. Aruoja, V., H.C. Dubourguier, K. Kasemets, and A. Kahru. Toxicity of Nanoparticles of CuO, ZnO and TiO2 to Microalgae Pseudokirchneriella subcapitata. Sci. Total Environ.407(4): 1461-1468.
Zinc chloride (ZnCl2)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	44.7	NA	NR	ug/L	LAB	1986. Blaise, C., R. Legault, N. Bermingham, R. Van Coillie, and P. Vasseur. A Simple Microplate Algal Assay Technique for Aquatic Toxicity Assessment. Toxic. Assess.1: 261-281.
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	65000	NA	NR	ug/L	LAB	1990. Wren, M.J., and D. McCarroll. A Simple and Sensitive Bioassay for the Detection of Toxic Materials Using a Unicellular Green Alga. Environ. Pollut.64(1): 87-91.
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	163	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	225	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	365	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	50	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.

Table A-16. Summary of Results from the EcoTox Database for Plants - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	52	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	54	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	90	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	97	NA	NR	ug/L	LAB	1988. Vasseur, P., P. Pandard, and D. Burnel. Influence of Some Experimental Factors on Metal Toxicity to Selenastrum capricornutum. Toxic. Assess.3(3): 331-444.
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	EC50		T	42	NR	NR	ug/L	LAB	2009. Aruoja, V., H.C. Dubourguier, K. Kasemets, and A. Kahru. Toxicity of Nanoparticles of CuO, ZnO and TiO2 to Microalgae Pseudokirchneriella subcapitata. Sci. Total Environ.407(4): 1461-1468.
Sulfuric acid, Zinc salt (1:1)	Green Algae	Algae, Moss, Fungi	Fresh	Growth	NOEC		T	5	NR	NR	ug/L	LAB	2009. Aruoja, V., H.C. Dubourguier, K. Kasemets, and A. Kahru. Toxicity of Nanoparticles of CuO, ZnO and TiO2 to Microalgae Pseudokirchneriella subcapitata. Sci. Total Environ.407(4): 1461-1468.

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Table A-17. Acronyms for Summary of Results from the EcoTox Database for Plants

% g = percent grams
% v/v = percent volume per volume
* = denotes value is the dilution water chemistry (aquatic), denotes value is from the pretreatment media (soil)
A = analytical grade
AI = active ingredient
AM = analytical grade, measured
AN = analytical grade, nominal
Bq = becquerels
cc = cocoons
d = day
D = dissolved
ECXX = effective concentration to XX% of test organisms
EDXX = effective dose to XX% of test organisms
ERXX = effective residue concentration to XX% of test organisms
F = formulation
fd = food
FIELDA = undefined
FIELDN = undefined
FIELDU = undefined
g = gram
h = hour
I = inorganic monomeric
ICXX = inhibition concentration to XX% of test organisms
kg = kilograms
L = liter
LAB = laboratory
lb = pounds
LCXX = lethal concentration to XX% of test organisms
LDXX = lethal dose to XX% of test organisms
LETC = lethal threshold concentration
LOEC = lowest observable effect concentration
LOEL = lowest observable effect level
LRXX = lethal residue concentration to XX% of test organisms
M = molar
m2 = square meter
MATC = maximum acceptable toxicant concentration
mg = milligram
ml = milliliter
mM = millimolar
mmol = millimole
mol/L = moles per liter
molal = molality
N = normal
NA = not applicable
NC = not coded
NE = no effect
ng = nanogram
nM = nanomolar
nmol = nanomoles
NOEC = no observable effect concentration
NOEL = no observable effect level
NOER = no observable effect residue
NR = not reported
NR-LETH = 100% mortality or 0% survival of test organisms
NR-ZERO = 0% mortality or 100% survival of test organisms
org = organism
Pop growth = population growth
SE = significant effect
T = total
uCI = microcuries
ug = micrograms
uM = micromolar
umol = micromoles

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Table A-18. Effects Based Tissue Concentrations for Plants - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Algae - Freshwater Colonial Green	Plant	Fresh	Cell	Growth	658	LOED	Absorption	Whole Body	1980. Cain, J.R., D.C. Paschal and C.M. Hayden. Arch Environ Contam Toxicol 09:9-16
Algae - Freshwater Colonial Green	Plant	Fresh	Cell	Growth	2340	LOED	Absorption	Whole Body	1980. Cain, J.R., D.C. Paschal and C.M. Hayden. Arch Environ Contam Toxicol 09:9-16
Algae - Freshwater Colonial Green	Plant	Fresh	Cell	Growth	3030	NOED	Absorption	Whole Body	1980. Cain, J.R., D.C. Paschal and C.M. Hayden. Arch Environ Contam Toxicol 09:9-16

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Table A-19. Effects Based Tissue Concentrations for Plants - PCBs

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Selenastrum capricornutum	Plant	Fresh	NS	Growth	592	ED10	Water	Whole Body	2004. McGrath JA, TF Parkerton, DM Di Toro. Environ Tox & Chem 23(10):2503-2517
Selenastrum capricornutum	Plant	Fresh	NS	Growth	592	ED10	Water	Whole Body	2004. McGrath JA, TF Parkerton, DM Di Toro. Environ Tox & Chem 23(10):2503-2517
Selenastrum capricornutum	Plant	Fresh	NS	Growth	2601	ED50	Water	Whole Body	2004. McGrath JA, TF Parkerton, DM Di Toro. Environ Tox & Chem 23(10):2503-2517
Selenastrum capricornutum	Plant	Fresh	NS	Growth	2601	ED50	Water	Whole Body	2004. McGrath JA, TF Parkerton, DM Di Toro. Environ Tox & Chem 23(10):2503-2517
Selenastrum capricornutum	Plant	Fresh	NS	Growth	205.96	ED50	Water	Whole Body	2004. McGrath JA, TF Parkerton, DM Di Toro. Environ Tox & Chem 23(10):2503-2517
Selenastrum capricornutum	Plant	Fresh	NS	Growth	225.07	ED50	Water	Whole Body	2004. McGrath JA, TF Parkerton, DM Di Toro. Environ Tox & Chem 23(10):2503-2517
Selenastrum capricornutum	Plant	Fresh	NS	Growth	195.35	ED50	Water	Whole Body	2004. McGrath JA, TF Parkerton, DM Di Toro. Environ Tox & Chem 23(10):2503-2517
Selenastrum capricornutum	Plant	Fresh	NS	Growth	184.73	ED50	Water	Whole Body	2004. McGrath JA, TF Parkerton, DM Di Toro. Environ Tox & Chem 23(10):2503-2517

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Table A-20. Acronyms for Effects Based Tissue Concentrations for Plants

ECXX = effect concentration for XX% of test population
EDXX = effect dose for XX% of test population
IPXX = undefined
kg = kilogram
LCXX = concentration lethal to XX% of test population
LDXX = dose lethal to XX% of test population
LOED = lowest observable effect dose
mg = milligram
NA = not applicable
NOED = no observable effect dose
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
ww = wet weight

Table A-21. Soil Concentrations Associated with Toxic Effects in Plants

Reference	Chemical	Test Organism		Soil pH	OM%	ERE	Tox Parameter	Tox Value - Soil Concentration (mg/kg dw)
Jiang and Singh, 1994	Arsenic	Ryegrass	*Lolium perenne*	5.6	0.7	Growth	MATC	22
Schweizer, 1967	Arsenic	Cotton	*Gossypium hirsutum stoneville 7A*	7.9	1.1	Growth	MATC	69
Schweizer, 1967	Arsenic	Rice	*Oryza sativa L. var. Nato*	7.9	1.1	Growth	MATC	4
Chaudhry, A., 1977	Barium	Bush bean	*Phaseolus vulgaris*	7.1-8.4	1.0-2.4	Growth	MATC	1,414
Kaplan, D.I., 1990	Beryllium	Kale	*Brassica oleracea v. acephalia L.*	6.5	1.9	Growth	MATC	56.8
Sajwan, K.S., 1996	Beryllium	Soybean	*Glycine max*	4.9	1.9	Growth	LOAEC	25
Sajwan, K.S., 1996	Beryllium	Soybean	*Glycine max*	6.5	1.9	Growth	LOAEC	25
Sajwan, K.S., 1996	Beryllium	Soybean	*Glycine max*	5.5	3.2	Growth	LOAEC	25
Sajwan, K.S., 1996	Beryllium	Soybean	*Glycine max*	6	3.2	Growth	LOAEC	25
Singh and Jeng, 1993	Cadmium	Ryegrass	ns	6.0	0.1	Growth	MATC	22
Adema, 1989	Cadmium	Lettuce	*Lacluca saliva*	5.1	3.7	Growth	MATC	57
Adema, 1989	Cadmium	Tomato	*Lycopersicon esculenlum*	5.1	3.7	Growth	MATC	57
Adema, 1989	Cadmium	Oats	*Avena saliva*	5.1	3.7	Growth	MATC	18
Lehoczky et al, 1996	Cadmium	Corn	*Zea mays*	4.2	4.43	Growth	MATC	71
Lehoczky et al, 1996	Cadmium	Garlic	*Allium salivum*	4.2	4.43	Growth	MATC	22
Monette, 1978	Cadmium	Barley	*Hordeum vulgare*	6.9	1.9	Growth	MATC	9
Kelly, 1979	Cadmium	White pine	*Pinus slrobus*	4.8	1.9	Growth	MATC	39
Kelly, 1979	Cadmium	Yellow birch	*Belula allenghaniensis*	4.8	1.9	Growth	MATC	39
Kelly, 1979	Cadmium	Choke cherry	*Prunus virginiana*	4.8	1.9	Growth	MATC	39
Kelly, 1979	Cadmium	Loblolly pine	*Pinus laeda*	4.8	1.9	Growth	MATC	39
Dixon, 1988	Cadmium	Red oak	*Quercus rubras*	6.0	1.5	Growth	MATC	14
Taylor, 1974	Cadmium	Alfalfa	*Medicago saliva*	6.4	1.0	Growth	MATC	79
Adema and Henzen, 1989	Chromium	Oat	*Avena sativa*	5.1	3.7	Growth	NOAEC	21
Adema and Henzen, 1989	Chromium	Tomato	*Lycopersicon esculentum*	5.1	3.7	Growth	NOAEC	20
Adema and Henzen, 1989	Chromium	Lettuce	*Latuca sativa*	5.1	3.7	Growth	cnbd	cnbd
Adema and Henzen, 1989	Chromium	Oat	*Avena sativa*	7.5	1.4	Growth	NOAEC	24
Adema and Henzen, 1989	Chromium	Tomato	*Lycopersicon esculentum*	7.5	1.4	Growth	NOAEC	23
Adema and Henzen, 1989	Chromium	Lettuce	*Latuca sativa*	7.5	1.4	Growth	NOAEC	20.4
Gunther and Pestemer, 1990	Chromium	Oat	*Avena sativa*	6.1	2.2	Growth	EC50	9
Gunther and Pestemer, 1990	Chromium	Turnip	*Brassica rapa*	6.1	2.2	Growth	EC50	3
Kadar and Morvai, 1998	Chromium	Carrot	*Daucus carota*	7.0	1.0	Growth	LOAEC	15
Kadar and Morvai, 1998	Chromium	Pea	*Pisum sativum*	7.0	1.0	Growth	NOAEC	109
Kadar and Morvai, 1998	Chromium	Carrot	*Daucus carota*	7.0	1.0	Growth	NOAEC	138
Kadar and Morvai, 1998	Chromium	Pea	*Pisum sativum*	7.0	1.0	Growth	NOAEC	138
Singh and Jeng, 1993	Chromium	Ryegrass	*Lolium perenne*	5.6	0.7	Growth	NOAEC	50
TN & Associates, Inc., 2000	Cobalt	Alfalfa	*Medicago Sative*	5.0	5.0	Growth	EC20	0.60
TN & Associates, Inc., 2000	Cobalt	Barley	*Hordeum vilgare*	5.0	5.0	Growth	EC20	29.8
TN & Associates, Inc., 2000	Cobalt	Radish	*Raphanus sative*	5.0	5.0	Growth	EC20	14.5
TN & Associates, Inc., 2000	Cobalt	Alfalfa	*Medicago Sative*	6.3	0.1	Growth	EC20	13.4
TN & Associates, Inc., 2000	Cobalt	Barley	*Hordeum vilgare*	6.3	0.1	Growth	EC20	36.4
TN & Associates, Inc., 2000	Cobalt	Radish	*Raphanus sative*	6.3	0.1	Growth	EC20	45.2
Kjaer and Elmegaard, 1996	Copper	Black bindweed	*Polygonum convolvulus*	6.4	1.7	Reproduction	MATC	251
Mozaffari et al, 1996	Copper	Citrus cultivar	*Cleopatra mandarin*	6.0	0.98	Growth	MATC	141
Torres and De Varennes, 1998	Copper	Perennial ryegrass	*Lolium perenne L.*	4.4 - 5.4	1.0	Growth	MATC	16
Gonzalez, 1991	Copper	Alfalfa	*Medicago sativa*	6.3	1.3	Growth	EC10	115
Gonzalez, 1991	Copper	Alfalfa	*Medicago sativa*	5.5	2.8	Growth	EC10	58
Gonzalez, 1991	Copper	Alfalfa	*Medicago sativa*	5.4	1.1	Growth	EC10	32
Davis and Barnes, 1973	Lead	Loblolly Pine	*Pinus taeda*	4	3	Growth	MATC	144
Davis and Barnes, 1973	Lead	Red Maple	*Acer rubrum*	4	3	Growth	MATC	144
Marques Dos Santos et al, 1993	Lead	Berseem clover	*Trifolium alexandrium*	6	0.94	Growth	MATC	316
Marques Dos Santos et al, 1993	Lead	Berseem clover	*Trifolium alexandrium*	7	3.11	Growth	MATC	141
Singh and Jeng, 1993	Lead	Ryegrass	*Lolium rigidum*	6	0.1	Growth	MATC	22
Reid, 1965	Manganese	Barley	*Hordeum vulgare*	4.6	0.78	Growth	MATC	71
Reid, 1965	Manganese	Barley	*Hordeum vulgare*	7.3	0.78	Growth	MATC	71
Rehab and Wallace, 1978	Manganese	Cotton	*Gossypium spp.*	6.6	2.4	Growth	MATC	707
Foy et al., 1998	Manganese	Nile grass	*Heroceras macrum*	4.62-5.16	0.017 - 4.24	Growth	MATC	707
TN&Associates Inc., 2000	Nickel	Alfalfa	*Medicago sative*	5.0	5.0	Growth	EC20	17

Table A-21. Soil Concentrations Associated with Toxic Effects in Plants

Reference	Chemical	Test Organism		Soil pH	OM%	ERE	Tox Parameter	Tox Value - Soil Concentration (mg/kg dw)
TN&Associates Inc., 2000	Nickel	Barley	*Hordeum vilgare*	5.0	5.0	Growth	EC20	7
TN&Associates Inc., 2000	Nickel	Brassica	*Brassica rapa*	5.0	5.0	Growth	EC20	10
TN&Associates Inc., 2000	Nickel	Alfalfa	*Medicago sative*	6.3	0.1	Growth	EC20	25
TN&Associates Inc., 2000	Nickel	Barley	*Hordeum vilgare*	6.3	0.1	Growth	EC20	65
TN&Associates Inc., 2000	Nickel	Brassica	*Brassica rapa*	6.3	0.1	Growth	EC20	32
Dixon, 1988	Nickel	Red Oak	*Quercus rubra*	6.0	1.5	Growth	MATC	32
Taylor and Allinson, 1981	Nickel	Alfalfa	*Medicago sativa*	6.9	1.7	Growth	MATC	177
Khalid and Tinsley, 1980	Nickel	Ryegrass	*Lelium perenne*	4.7	4.5	Growth	MATC	52
Taylor, 1974	Nickel	Alfalfa	*Medicago sativa*	6.4	1.0	Growth	MATC	177
Halstead et al, 1969	Nickel	Oat	*Avena sativa*	6.1	1.4	Reproduction	MATC	71
Mitchell et al., 1988	PAHs - Anthrac	Oats	*Avena sativa*	5.5	2.0	Growth	EC50	30
Mitchell et al., 1988	PAHs - Anthrac	Cucumber	*Cucumus sativus*	5.5	2.0	Growth	EC50	720
Leyval and Binet, 1998	PAHs - Mixture	Perrenial ryegrass	*Lolium perenne L.*	6.80	1.50	Growth	LOAEC	100
Mitchell et al., 1988	PAHs - Anthrac	Oats	*Avena sativa*	5.5	2.0	Mortality	LC50	525
Mitchell et al., 1988	PAHs - Anthrac	Cucumber	*Cucumus sativus*	5.5	2.0	Mortality	LC50	>1000
Mitchell et al., 1988	PAHs - Anthrac	Soybean	*Glycine max*	5.5	2.0	Mortality	LC50	>1000
Mitchell et al., 1988	PAHs - Anthrac	Heath banksia	*Banksia ericifolia*	5.5	2.0	Mortality	LC50	>1000
Mitchell et al., 1988	PAHs - Anthrac	She-oak	*Casuarina distyla*	5.5	2.0	Mortality	LC50	>1000
Mitchell et al., 1988	PAHs - Anthrac	Yellow bloodwood	*Eucalyptus eximia*	5.5	2.0	Mortality	LC50	>1000
Mitchell et al., 1988	PAHs - Anthrac	Soybean	*Glycine max*	5.5	2.0	Growth	EC50	>1000
Mitchell et al., 1988	PAHs - Anthrac	Heath banksia	*Banksia ericifolia*	5.5	2.0	Growth	EC50	>1000
Mitchell et al., 1988	PAHs - Anthrac	She-oak	*Casuarina distyla*	5.5	2.0	Growth	EC50	>1000
Mitchell et al., 1988	PAHs - Anthrac	Yellow bloodwood	*Eucalyptus eximia*	5.5	2.0	Growth	EC50	>1000
TN & Associates, 2000	Selenium	Alfalfa	*Medicago sativa*	6.3	0.1	Growth	EC20	0.1
TN & Associates, 2000	Selenium	Barley	*Hordeum vilgare*	6.3	0.1	Growth	EC20	0.2
TN & Associates, 2000	Selenium	Brassica	*Brassica rapa*	6.3	0.1	Growth	EC20	0.2
Singh et al., 1980b	Selenium	Raya	*Brassica juncea*	7.9	0.17	Growth	MATC	1.4
Singh et al., 1980a	Selenium	Berseem	*Trifolium alexandrinum*	8	0.14	Growth	MATC	1.6
Wan et al., 1988	Selenium	Alfalfa	*Medicago sativa* L.	5.6	1.3	Growth	MATC	0.9
Wan et al., 1988	Selenium	Alfalfa	*Medicago sativa* L.	6.9	1.1	Growth	MATC	0.9
Singh and Singh, 1979	Selenium	Cowpea	*Vigna sinensis*	8	0.1	Growth	MATC	0.8
Weaver and Klarich, 1973	Silver	soybeans	*Glycine max*	7.4	0.17 - 2.8	Growth	MATC	3162
Weaver and Klarich, 1973	Silver	wheat	*Triticum aestivum*	7.4	0.17 - 2.8	Growth	MATC	316
Weaver and Klarich, 1973	Silver	corn	*Zea mays*	7.4	0.17 - 2.8	Growth	MATC	316
Weaver and Klarich, 1973	Silver	sunflower	*Helianthus annus*	7.4	0.17 - 2.8	Growth	MATC	316
Kaplan et al, 1990	Vanadium	Broccoli	*Brassica oleracea*	6.5	1.1	Growth	LOAEC	100
Kaplan et al, 1990	Vanadium	Broccoli	*Brassica oleracea*	6.5	1.9	Growth	NOAEC	100
White et al., 1979b	Zinc	Soybean	*Glycine max*	6.5	1.2	Growth	MATC	185
Roszyk et al., 1988	Zinc	Oats	*Avena sp.*	4.3	0.8	Growth	MATC	143
Roszyk et al., 1988	Zinc	Oats	*Avena sp.*	5.3	2.6	Growth	MATC	155
Roszyk et al., 1988	Zinc	Oats	*Avena sp.*	5.7	1.3	Growth	MATC	159
Sheppard et al., 1993	Zinc	Lettuce	*Lactuca sativa*	6.3	<1	Growth	MATC	173

OM = organic matter
ERE = ecologically relevant endpoint
mg/kg dw = milligrams per kilograms dry weight
MATC - maximum acceptable toxicant concentration, geometric mean of the LOAEC and NOAEC
LOAEC = lowest observable adverse effect concentration
ns = not specified
NOAEC = no observable adverse effect concentration
cnbd = could not be determined
ECXX = effective concentration to XX% of test organisms
LCXX = lethal concentration to XX% of test organisms
PAHs = polycyclic aromatic hydrocarbons

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Appendix B

Exposure Pathways – Benthic Invertebrates

Table B-1. Summary of Results from the EcoTox Database for Invertebrates - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum	Amphipod	Crustaceans	Fresh	Growth	LC50		A	NR			ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Aluminum nitrate	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Elangovan, R., S. Ballance, K.N. White, C.R. McCrohan, and J.J. Powell. Accumulation of Aluminium by the Freshwater Crustacean Asellus aquaticus in Neutral Water. Environ. Pollut.106(3): 257-263.
Aluminum chloride	Buzzer Midge	Insects/Spiders	Fresh	Mortality	LC50		N	30000			ug/L	LAB	2001. Fargasova. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Sulfuric acid, Aluminum salt (3:2)	Caddisfly	Insects/Spiders	Fresh	Growth	EC50	See Remarks	T	NR	NA	NR	ug/L	LAB	1996. Vuori, K.M.. Acid-Induced Acute Toxicity of Aluminium to Three Species of Filter Feeding Caddis Larvae (Trichoptera, Arctopsychidae and Hydropsychidae). Freshw. Biol.35(1): 179-188.
Sulfuric acid, Aluminum salt (3:2)	Caddisfly	Insects/Spiders	Fresh	Growth	EC50	See Remarks	T	NR	NA	NR	ug/L	LAB	1996. Vuori, K.M.. Acid-Induced Acute Toxicity of Aluminium to Three Species of Filter Feeding Caddis Larvae (Trichoptera, Arctopsychidae and Hydropsychidae). Freshw. Biol.35(1): 179-188.
Sulfuric acid, Aluminum salt (3:2)	Caddisfly	Insects/Spiders	Fresh	Growth	EC50	See Remarks	T	NR	NA	NR	ug/L	LAB	1996. Vuori, K.M.. Acid-Induced Acute Toxicity of Aluminium to Three Species of Filter Feeding Caddis Larvae (Trichoptera, Arctopsychidae and Hydropsychidae). Freshw. Biol.35(1): 179-188.
Sulfuric acid, Aluminum salt (3:2)	Calanoid Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1984. Minzoni, F.. Effects of Aluminum on Different Forms of Phosphorus and Freshwater Plankton. Environ. Technol. Lett.5: 425-432.
Aluminum chloride (AlCl3)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	3200	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid, Aluminum salt (3:2)	Cladoceran	Crustaceans	Fresh	Mortality	NR	Not Reported	T	554	L	266	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Cladoceran	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Cladoceran	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1984. Minzoni, F.. Effects of Aluminum on Different Forms of Phosphorus and Freshwater Plankton. Environ. Technol. Lett.5: 425-432.
Sulfuric acid, Aluminum salt (3:2)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	T	568	L	279	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	564	L	218	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Aluminum nitrate	Great Pond Snail	Molluscs	Fresh	Behavior	SE		T	300			ug/L	LAB	2000. Campbell et al. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum nitrate	Great Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Elangovan, R., K.N. White, and C.R. McCrohan. Bioaccumulation of Aluminium in the Freshwater Snail Lymnaea stagnalis at Neutral pH. Environ. Pollut.96(1): 29-33.
Sulfuric acid, Aluminum salt (3:2)	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	D	NR	ug/L	LAB	1991. Tabak, L.M., and K.E. Gibbs. Effects of Aluminum, Calcium and Low pH on Egg Hatching and Nymphal Survival of Cloeon triangulifer McDunnough (Ephemeroptera: Baetidae). Hydrobiologia218(2): 157-166.
Sulfuric acid, Aluminum salt (3:2)	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Tabak, L.M., and K.E. Gibbs. Effects of Aluminum, Calcium and Low pH on Egg Hatching and Nymphal Survival of Cloeon triangulifer McDunnough (Ephemeroptera: Baetidae). Hydrobiologia218(2): 157-166.
Sulfuric acid, Aluminum salt (3:2)	Mayfly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Mayfly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.

Table B-1. Summary of Results from the EcoTox Database for Invertebrates - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum chloride (AlCl3)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1985. Havas, M., and G.E. Likens. Toxicity of Aluminum and Hydrogen Ions to Daphnia catawba, Holopedium gibberum, Chaoborus punctipennis, and Chironomus anthrocinus from Mirror Lake, N.H.. Can. J. Zool.63: 1114-1119.
Sulfuric acid, Aluminum salt (3:2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Lamb, D.S., and G.C. Bailey. Effects of Aluminum Sulfate to Midge Larvae (Diptera: Chironomidae) and Rainbow Trout (Salmo Gairdneri). EPA 440/5-83-001, Lake Restoration, Protection and Management: 307-312.
Sulfuric acid, Aluminum salt (3:2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1981. Lamb, D.S., and G.C. Bailey. Acute and Chronic Effects of Alum to Midge Larvae (Diptera: Chironomidae). Bull. Environ. Contam. Toxicol.27: 59-67.
Sulfuric acid, Aluminum salt (3:2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Lamb, D.S., and G.C. Bailey. Effects of Aluminum Sulfate to Midge Larvae (Diptera: Chironomidae) and Rainbow Trout (Salmo Gairdneri). EPA 440/5-83-001, Lake Restoration, Protection and Management: 307-312.
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	32000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	43000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	19000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	26000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	3000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	4000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..

Table B-1. Summary of Results from the EcoTox Database for Invertebrates - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	32000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	43000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum chloride (AlCl3)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	120200	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum chloride (AlCl3)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	181400	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum chloride (AlCl3)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	275100	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	79000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Aluminum nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Aluminum nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1900	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Aluminum nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	429200	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	43100	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	50200	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	18600	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	38400	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum chloride (AlCl3)	Nematode	Worms	Fresh	Mortality	LOEC	Not Reported	T	100000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum chloride (AlCl3)	Nematode	Worms	Fresh	Mortality	LOEC	Not Reported	T	180000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..

Table B-1. Summary of Results from the EcoTox Database for Invertebrates - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum chloride (AlCl3)	Nematode	Worms	Fresh	Mortality	LOEC	Not Reported	T	100000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	LOEC	Not Reported	T	1000000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	LOEC	Not Reported	T	320000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	LOEC	Not Reported	T	10000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	LOEC	Not Reported	T	56000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	LOEC	Not Reported	T	10000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	LOEC	Not Reported	T	32000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	NOEC	Not Reported	T	100000	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Sulfuric acid, Aluminum salt (3:2)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Jaworska, M., J. Sepiol, and P. Tomasik. Effect of Metal Ions Under Laboratory Conditions on the Entomopathogenic Steinernema carpocapsae (Rhabditida: Steinernematidae). Water Air Soil Pollut.88(3-4): 331-341.
Aluminum	Nematodes	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Pea Cockle	Molluscs	Fresh	Mortality	LC50	Not Reported	L	1000	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Aluminum	Pea Cockle	Molluscs	Fresh	Mortality	LC50	Not Reported	L	400	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Aluminum	Pea Cockle	Molluscs	Fresh	Mortality	LC50	Not Reported	L	400	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Aluminum chloride (AlCl3)	Phantom Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1985. Havas, M., and G.E. Likens. Toxicity of Aluminum and Hydrogen Ions to Daphnia catawba, Holopedium gibberum, Chaoborus punctipennis, and Chironomus anthrocinus from Mirror Lake, N.H.. Can. J. Zool.63: 1114-1119.
Sulfuric acid, Aluminum salt (3:2)	Planaria	Worms	Fresh	Growth	NR	Heart	T	NR	NR	NR	ug/L	LAB	1998. Calevro, F., C. Filippi, P. Deri, C. Albertosi, and R. Batistoni. Toxic Effects of Aluminium, Chromium and Cadmium in Intact and Regenerating Freshwater Planarians. Chemosphere37(4): 651-659.
Sulfuric acid, Aluminum salt (3:2)	Planaria	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Calevro, F., C. Filippi, P. Deri, C. Albertosi, and R. Batistoni. Toxic Effects of Aluminium, Chromium and Cadmium in Intact and Regenerating Freshwater Planarians. Chemosphere37(4): 651-659.
Aluminum nitrate	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	110000	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Aluminum chloride (AlCl3)	Pouch Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	55500	NA	NR	ug/L	LAB	1984. Call, D.J., L.T. Brooke, C.A. Lindberg, T.P. Markee, D.J. McCauley, and S.H. Poirier. Toxicity of Aluminum to Freshwater Organisms in Water of pH 6.5-8.5. Tech.Rep.Project No.549-238-RT-WRD, Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI/November 27, 1984 Memo to C.Stephan, U.S.EPA, Duluth, MN: 46 p..

Table B-1. Summary of Results from the EcoTox Database for Invertebrates - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum chloride (AlCl3)	Pouch Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	24700	NA	NR	ug/L	LAB	1984. Call, D.J., L.T. Brooke, C.A. Lindberg, T.P. Markee, D.J. McCauley, and S.H. Poirier. Toxicity of Aluminum to Freshwater Organisms in Water of pH 6.5-8.5. Tech.Rep.Project No.549-238-RT-WRD, Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI/November 27, 1984 Memo to C.Stephan, U.S.EPA, Duluth, MN: 46 p..
Aluminum	Roundworm	Worms	Fresh	Mortality	LC50	Not Reported	T	17000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Roundworm	Worms	Fresh	Mortality	LC50	Not Reported	T	22000	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Roundworm	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Schouten, A.J., and I.R. Van der Brugge. Acute Toxiciteit van Aluminium en H(+)Ionen Concentratie voor Bodemnematoden uit een Zuur en Kalkrijk Dennenbos. (I) Ontwikkeling en Toepassing van. Rep.No.RIVM-718603001, Rijksinstituut voor de Volksgezondheid en Milieuhygiene, Bilthoven, Netherlands: 83 p..
Aluminum	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	89	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Aluminum	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3150	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Sulfuric acid, Aluminum salt (3:2)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Scud	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Aluminum	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	L	400	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Sulfuric acid, Aluminum salt (3:2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Sulfuric acid, Aluminum salt (3:2)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	15000	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Aluminum chloride (AlCl3)	Turbellarian, Flatworm	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Brooke, L.. Results of Acute Exposures to Aluminum at pH >6.5 with Planaria and Daphnids. July 25th Memo to C.Stephan, U.S.EPA, Duluth, MN: 5 p..
Aluminum	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	9500	NA	NR	ug/L	LAB	1988. Wakabayashi, M., R. Konno, and T. Nishiido. Relative Lethal Sensitivity of Two Daphnia Species to Chemicals. Tokyo-to Kankyo Kagaku Kenkyusho Nenpo: 126-128.
Aluminum	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	3500	NA	NR	ug/L	LAB	1988. Wakabayashi, M., R. Konno, and T. Nishiido. Relative Lethal Sensitivity of Two Daphnia Species to Chemicals. Tokyo-to Kankyo Kagaku Kenkyusho Nenpo: 126-128.
Aluminum	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	12000	NA	NR	ug/L	LAB	1988. Wakabayashi, M., R. Konno, and T. Nishiido. Relative Lethal Sensitivity of Two Daphnia Species to Chemicals. Tokyo-to Kankyo Kagaku Kenkyusho Nenpo: 126-128.
Aluminum	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	2600	NA	NR	ug/L	LAB	1988. Wakabayashi, M., R. Konno, and T. Nishiido. Relative Lethal Sensitivity of Two Daphnia Species to Chemicals. Tokyo-to Kankyo Kagaku Kenkyusho Nenpo: 126-128.
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	524	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	153440	NR	NR	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3990	NR	NR	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.

Table B-1. Summary of Results from the EcoTox Database for Invertebrates - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1984. Call, D.J., L.T. Brooke, C.A. Lindberg, T.P. Markee, D.J. McCauley, and S.H. Poirier. Toxicity of Aluminum to Freshwater Organisms in Water of pH 6.5-8.5. Tech.Rep.Project No.549-238-RT-WRD, Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI/November 27, 1984 Memo to C.Stephan, U.S.EPA, Duluth, MN: 46 p..
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36900	NA	NR	ug/L	LAB	1984. Call, D.J., L.T. Brooke, C.A. Lindberg, T.P. Markee, D.J. McCauley, and S.H. Poirier. Toxicity of Aluminum to Freshwater Organisms in Water of pH 6.5-8.5. Tech.Rep.Project No.549-238-RT-WRD, Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI/November 27, 1984 Memo to C.Stephan, U.S.EPA, Duluth, MN: 46 p..
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8600	NA	NR	ug/L	LAB	1984. Call, D.J., L.T. Brooke, C.A. Lindberg, T.P. Markee, D.J. McCauley, and S.H. Poirier. Toxicity of Aluminum to Freshwater Organisms in Water of pH 6.5-8.5. Tech.Rep.Project No.549-238-RT-WRD, Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI/November 27, 1984 Memo to C.Stephan, U.S.EPA, Duluth, MN: 46 p..
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	3650	NR	NR	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23630	NR	NR	ug/L	LAB	1995. Fort, D.J., and E.L. Stover. Impact of Toxicities and Potential Interactions of Flocculants and Coagulant Aids on Whole Effluent Toxicity Testing. Water Environ. Res.67(6): 921-925.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35970	NR	NR	ug/L	LAB	1995. Fort, D.J., and E.L. Stover. Impact of Toxicities and Potential Interactions of Flocculants and Coagulant Aids on Whole Effluent Toxicity Testing. Water Environ. Res.67(6): 921-925.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38200	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38200	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38200	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38200	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1610	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1770	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1985. Havas, M., and G.E. Likens. Toxicity of Aluminum and Hydrogen Ions to Daphnia catawba, Holopedium gibberum, Chaoborus punctipennis, and Chironomus anthrocinus from Mirror Lake, N.H.. Can. J. Zool.63: 1114-1119.
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1020	NA	NR	ug/L	LAB	1985. Havas, M., and G.E. Likens. Changes in 22Na Influx and Outflux in Daphnia magna (Straus) as a Function of Elevated A1 Concentrations in Soft Water at Low pH. Proc. Natl. Acad. Sci. U.S.A.82: 7345-7349.
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1985. Havas, M., and G.E. Likens. Toxicity of Aluminum and Hydrogen Ions to Daphnia catawba, Holopedium gibberum, Chaoborus punctipennis, and Chironomus anthrocinus from Mirror Lake, N.H.. Can. J. Zool.63: 1114-1119.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	7500	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1984. Minzoni, F.. Effects of Aluminum on Different Forms of Phosphorus and Freshwater Plankton. Environ. Technol. Lett.5: 425-432.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	555	L	265	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Havas, M.. Aluminum Bioconcentration and Toxicity to Daphnia magna in Soft Water at Low pH. Can. J. Fish. Aquat. Sci.42: 1741-1748.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Havens, K.E.. Littoral Zooplankton Responses to Acid and Aluminum Stress During Short-Term Laboratory Bioassays. Environ. Pollut.73(1): 71-84.
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	680	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	4260	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	1600	NA	NR	ug/L	LAB	1986. McCauley, D.J., L.T. Brooke, D.J. Call, and C.A. Lindberg. Acute and Chronic Toxicity of Aluminum to Ceriodaphnia dubia at Various pH's. Center for Lake Superior Environmental Studies, University of Wisconsin-Superior, Superior, WI: 15 p..
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	1900	NA	NR	ug/L	LAB	1986. McCauley, D.J., L.T. Brooke, D.J. Call, and C.A. Lindberg. Acute and Chronic Toxicity of Aluminum to Ceriodaphnia dubia at Various pH's. Center for Lake Superior Environmental Studies, University of Wisconsin-Superior, Superior, WI: 15 p..
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	2840	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	1000	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1890	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	700	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	12100	NA	NR	ug/L	LAB	1984. Call, D.J., L.T. Brooke, C.A. Lindberg, T.P. Markee, D.J. McCauley, and S.H. Poirier. Toxicity of Aluminum to Freshwater Organisms in Water of pH 6.5-8.5. Tech.Rep.Project No.549-238-RT-WRD, Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI/November 27, 1984 Memo to C.Stephan, U.S.EPA, Duluth, MN: 46 p..
Aluminum chloride (AlCl3)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	4900	NA	NR	ug/L	LAB	1984. Call, D.J., L.T. Brooke, C.A. Lindberg, T.P. Markee, D.J. McCauley, and S.H. Poirier. Toxicity of Aluminum to Freshwater Organisms in Water of pH 6.5-8.5. Tech.Rep.Project No.549-238-RT-WRD, Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI/November 27, 1984 Memo to C.Stephan, U.S.EPA, Duluth, MN: 46 p..
Sulfuric acid, Aluminum salt (3:2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	120900	NA	NR	ug/L	LAB	1995. Mackie, G.L., and B.W. Kilgour. Efficacy and Role of Alum in Removal of Zebra Mussel Veliger Larvae from Raw Water Supplies. Water Res.29(2): 731-744.
Sulfuric acid, Aluminum salt (3:2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	89000	NA	NR	ug/L	LAB	1995. Mackie, G.L., and B.W. Kilgour. Efficacy and Role of Alum in Removal of Zebra Mussel Veliger Larvae from Raw Water Supplies. Water Res.29(2): 731-744.
Sulfuric acid, Aluminum salt (3:2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	115300	NA	NR	ug/L	LAB	1995. Mackie, G.L., and B.W. Kilgour. Efficacy and Role of Alum in Removal of Zebra Mussel Veliger Larvae from Raw Water Supplies. Water Res.29(2): 731-744.

Table B-1. Summary of Results from the EcoTox Database for Invertebrates - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	76100	NA	NR	ug/L	LAB	1995. Mackie, G.L., and B.W. Kilgour. Efficacy and Role of Alum in Removal of Zebra Mussel Veliger Larvae from Raw Water Supplies. Water Res.29(2): 731-744.
Sulfuric acid, Aluminum salt (3:2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	130500	NA	NR	ug/L	LAB	1995. Mackie, G.L., and B.W. Kilgour. Efficacy and Role of Alum in Removal of Zebra Mussel Veliger Larvae from Raw Water Supplies. Water Res.29(2): 731-744.
Sulfuric acid, Aluminum salt (3:2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Mackie, G.L., and B.W. Kilgour. Efficacy and Role of Alum in Removal of Zebra Mussel Veliger Larvae from Raw Water Supplies. Water Res.29(2): 731-744.
Sulfuric acid, Aluminum salt (3:2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	150000	NA	NR	ug/L	LAB	1995. Mackie, G.L., and B.W. Kilgour. Efficacy and Role of Alum in Removal of Zebra Mussel Veliger Larvae from Raw Water Supplies. Water Res.29(2): 731-744.

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Table B-2. Summary of Results from the EcoTox Database for Invertebrates - Antimony

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Antimony	Amphipod	Crustaceans	Fresh	Mortality	LC50		A	NR			ug/L	LAB	. . . .
Antimony	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	687	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Antimony trichloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4510	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.1	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5300	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Antimony trichloride	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	7050	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	29600	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	1900	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	7050	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	7800	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	5420	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	5500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	4160	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3900	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

Table B-3. Summary of Results from the EcoTox Database for Invertebrates - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic	Amphipod	Crustaceans	Fresh	Mortality	LC50		AN	426			ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Sodium arsenate (Na2HAsO4)	Amphipod	Crustaceans	Fresh	Mortality	LC50		AM	483			ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Arsenic oxide	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1931. Surber, E.W., and O.L. Meehean. Lethal Concentrations of Arsenic for Certain Aquatic Organisms. Trans. Am. Fish. Soc.61: 225-239.
Arsenic oxide	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1931. Surber, E.W., and O.L. Meehean. Lethal Concentrations of Arsenic for Certain Aquatic Organisms. Trans. Am. Fish. Soc.61: 225-239.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1055000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	239000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2490000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3519000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3619000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	395000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4190000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5104000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1498000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1707000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	184000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2262000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2456000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	363000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4028000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	944000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1971000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	285000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.

Table B-3. Summary of Results from the EcoTox Database for Invertebrates - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4176000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	692000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	696000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	814000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	919000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Disodium salt	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Arsenic acid (H3AsO4), Disodium salt	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Arsenic acid (H3AsO4), Disodium salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	90900	NR	NR	ug/L	LAB	1995. Abdelghani, A.A., Y.V. Pramar, T.K. Mandal, P.B. Tchounwou, and L. Heyer. Levels and Toxicities of Selected Inorganic and Organic Contaminants in a Swamp Environment. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes30(5): 717-731.
Arsenic acid (H3AsO4), Disodium salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	51000	NR	NR	ug/L	LAB	1995. Abdelghani, A.A., Y.V. Pramar, T.K. Mandal, P.B. Tchounwou, and L. Heyer. Levels and Toxicities of Selected Inorganic and Organic Contaminants in a Swamp Environment. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes30(5): 717-731.
Arsenic oxide	Damselfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1931. Surber, E.W., and O.L. Meehean. Lethal Concentrations of Arsenic for Certain Aquatic Organisms. Trans. Am. Fish. Soc.61: 225-239.
Arsenic oxide	Dragonfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1931. Surber, E.W., and O.L. Meehean. Lethal Concentrations of Arsenic for Certain Aquatic Organisms. Trans. Am. Fish. Soc.61: 225-239.
Arsenic oxide	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	55.4	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.
Arsenic oxide	Fleshy Prawn	Crustaceans	NR	Mortality	LC50	Not Reported	F	2.43	NA	NR	ug/L	LAB	1990. Chen, B., and M. Chen. Acute Toxicity of Arsenic, Phenol, Mercury and Chromium to the Larvae of Penaeus orientali. Mar. Sci.14(3): 51-53.
Arsenic oxide	Fleshy Prawn	Crustaceans	NR	Mortality	LC50	Not Reported	F	2.85	NA	NR	ug/L	LAB	1990. Chen, B., and M. Chen. Acute Toxicity of Arsenic, Phenol, Mercury and Chromium to the Larvae of Penaeus orientali. Mar. Sci.14(3): 51-53.
Arsenic oxide	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1931. Surber, E.W., and O.L. Meehean. Lethal Concentrations of Arsenic for Certain Aquatic Organisms. Trans. Am. Fish. Soc.61: 225-239.
Arsenic oxide	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1931. Surber, E.W., and O.L. Meehean. Lethal Concentrations of Arsenic for Certain Aquatic Organisms. Trans. Am. Fish. Soc.61: 225-239.
Arsenic oxide	Mayfly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1931. Surber, E.W., and O.L. Meehean. Lethal Concentrations of Arsenic for Certain Aquatic Organisms. Trans. Am. Fish. Soc.61: 225-239.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1069000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1303000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1654000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	176000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2241000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2925000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	52000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.

Table B-3. Summary of Results from the EcoTox Database for Invertebrates - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	69000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1155000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	128000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	41700	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	49200	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	639000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	709000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	735000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	811000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	104000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	33100	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	358000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	435000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	454000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	481000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	502000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1492000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1509000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1904000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	21400	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2336000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.

Table B-3. Summary of Results from the EcoTox Database for Invertebrates - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3982000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	470000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	93500	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1127000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1191000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2251000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	267000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	31100	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	73600	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	790000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	906000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1235000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	235000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	394000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	47200	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	608000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic acid (H3AsO4), Sodium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	728000	NR	NR	ug/L	LAB	2000. Jeyasingham, K., and N. Ling. Acute Toxicity of Arsenic to Three Species of New Zealand Chironomids: Chironomus zealandicus, Chironomus sp. a and Polypedilum pavidus (Diptera, Chironomidae). Bull. Environ. Contam. Toxicol.64(5): 708-715.
Arsenic oxide	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	36700*	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Arsenic oxide	Midge Family	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1931. Surber, E.W., and O.L. Meehean. Lethal Concentrations of Arsenic for Certain Aquatic Organisms. Trans. Am. Fish. Soc.61: 225-239.
Arsenic oxide	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	40000	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Arsenic oxide	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	961	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.

Table B-3. Summary of Results from the EcoTox Database for Invertebrates - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic pentoxide	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	973	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic oxide	Prawn	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40000	NA	NR	ug/L	LAB	1988. Lanzer-DeSouza, M.E., and N.M.M. Dasilva. Influence of Pollutants on Aquatic Crustaceans Decapoda palaemonidae. Iheringia Ser. Misc.2: 13-30.
Arsenic oxide	Prawn	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	40000	NA	NR	ug/L	LAB	1988. Lanzer-DeSouza, M.E., and N.M.M. Dasilva. Influence of Pollutants on Aquatic Crustaceans Decapoda palaemonidae. Iheringia Ser. Misc.2: 13-30.
Arsenic oxide	Prawn	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	2000	NA	NR	ug/L	LAB	1988. Lanzer-DeSouza, M.E., and N.M.M. Dasilva. Influence of Pollutants on Aquatic Crustaceans Decapoda palaemonidae. Iheringia Ser. Misc.2: 13-30.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	150000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	40000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	56000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	62000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	84000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	95000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	44000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	57000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	78000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	29000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.

Table B-3. Summary of Results from the EcoTox Database for Invertebrates - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	18000	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	6600	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic acid (H3AsO4), Disodium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	8200	NA	NR	ug/L	LAB	1973. Schaefer, E.D., and W.O. Pipes. Temperature and the Toxicity of Chromate and Arsenate to the Rotifer, Philodina roseola. Water Res.7(12): 1781-1790.
Arsenic oxide	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	F	80.6	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.
Arsenic	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	494	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Arsenic	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	426	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Arsenic acid (H3AsO4), Disodium salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	483	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Arsenic acid (H3AsO4), Disodium salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	581	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Arsenic oxide	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	88	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic oxide	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1931. Surber, E.W., and O.L. Meehean. Lethal Concentrations of Arsenic for Certain Aquatic Organisms. Trans. Am. Fish. Soc.61: 225-239.
Arsenic pentoxide	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	973	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic oxide	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	961	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic acid (H3AsO4), Disodium salt	Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1992. Maeda, S., A. Ohki, K. Kusadome, T. Kuroiwa, I. Yoshifuku, and K. Naka. Bioaccumulation of Arsenic and Its Fate in a Freshwater Food Chain. Appl. Organomet. Chem.6(2): 213-219.
Arsenic acid (H3AsO4), Disodium salt	Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1940000	NA	NR	ug/L	LAB	1992. Maeda, S., A. Ohki, K. Kusadome, T. Kuroiwa, I. Yoshifuku, and K. Naka. Bioaccumulation of Arsenic and Its Fate in a Freshwater Food Chain. Appl. Organomet. Chem.6(2): 213-219.
Arsenic oxide	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	9280*	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Arsenic oxide	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	NR	Not Reported	T	961	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic pentoxide	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	NR	Not Reported	T	973	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic oxide	Stonefly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	961	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic pentoxide	Stonefly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	973	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic acid (H3AsO4), Disodium salt	Swan Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDA	1992. Reuther, R.. Arsenic Introduced into a Littoral Freshwater Model Ecosystem. Sci. Total Environ.115(3): 219-237.
Arsenic acid (H3AsO4), Disodium salt	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	398110	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.

Table B-3. Summary of Results from the EcoTox Database for Invertebrates - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Disodium salt	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	398110	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Arsenic acid (H3AsO4), Disodium salt	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	190540	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Arsenic acid (H3AsO4), Disodium salt	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	190540	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Arsenic acid (H3AsO4), Disodium salt	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	127360	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Arsenic acid (H3AsO4), Disodium salt	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	127360	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Arsenic acid (H3AsO4), Disodium salt	Tubificid Worm	Worms	Fresh	Mortality	NR	Not Reported	T	25000	NA	NR	ug/L	FIELDA	1992. Reuther, R.. Arsenic Introduced into a Littoral Freshwater Model Ecosystem. Sci. Total Environ.115(3): 219-237.
Arsenic oxide	Water Bug	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Lanzer-DeSouza, M.E., and N.M.M. Dasilva. Influence of Pollutants on Aquatic Crustaceans Decapoda palaemonidae. Iheringia Ser. Misc.2: 13-30.
Arsenic oxide	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	D	3400	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Arsenic acid (H3AsO4), Disodium salt	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Maeda, S., R. Inoue, T. Kozono, T. Tokuda, A. Ohki, and T. Takeshita. Arsenic Metabolism in a Freshwater Food Chain. Chemosphere20(1-2): 101-108.
Arsenic acid (H3AsO4), Disodium salt	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Maeda, S., R. Inoue, T. Kozono, T. Tokuda, A. Ohki, and T. Takeshita. Arsenic Metabolism in a Freshwater Food Chain. Chemosphere20(1-2): 101-108.
Arsenic	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Arsenic	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Arsenic	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1900	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Arsenic	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Arsenic acid (H3AsO4)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6600	NA	NR	ug/L	LAB	1987. Burton, G.A.,Jr., J.M. Lazorchak, W.T. Waller, and G.R. Lanza. Arsenic Toxicity Changes in the Presence of Sediment. Bull. Environ. Contam. Toxicol.38(3): 491-499.
Arsenic acid (H3AsO4)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1987. Burton, G.A.,Jr., J.M. Lazorchak, W.T. Waller, and G.R. Lanza. Arsenic Toxicity Changes in the Presence of Sediment. Bull. Environ. Contam. Toxicol.38(3): 491-499.
Arsenic acid (H3AsO4), Disodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	51880	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Arsenic acid (H3AsO4), Disodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	44660	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Arsenic acid (H3AsO4), Disodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5400	NA	NR	ug/L	LAB	1982. Qureshi, A.A., K.W. Flood, S.R. Thompson, S.M. Janhurst, C.S. Inniss, and D.A. Rokosh. Comparison of a Luminescent Bacterial Test with Other Bioassays for Determining Toxicity of Pure Compounds and Complex Effluents. In: J.G.Pearson, R.B.Foster and W.E.Bishop (Eds.), Aquatic Toxicology and Hazard Assessment, 5th Confrence, ASTM STP 766, Philadelphia, PA: 179-195.
Arsenic acid (H3AsO4), Disodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7400	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Arsenic acid (H3AsO4), Disodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2850	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Arsenic acid (H3AsO4), Sodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Arsenic acid (H3AsO4), Sodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29.1	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.

Table B-3. Summary of Results from the EcoTox Database for Invertebrates - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Trisodium salt	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	4900	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Arsenic acid (H3AsO4), Trisodium salt	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	2800	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Arsenic acid (H3AsO4), Trisodium salt	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	2500	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Arsenic acid (H3AsO4), Trisodium salt	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	2200	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Arsenic acid (H3AsO4), Trisodium salt	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	1900	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Arsenic oxide	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	5800	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Arsenic oxide	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	10000	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Arsenic acid (H3AsO4), Disodium salt	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Maeda, S., R. Inoue, T. Kozono, T. Tokuda, A. Ohki, and T. Takeshita. Arsenic Metabolism in a Freshwater Food Chain. Chemosphere20(1-2): 101-108.
Arsenic acid (H3AsO4), Sodium salt	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1420	NA	NR	ug/L	LAB	1995. Naddy, R.B., T.W. LaPoint, and S.J. Klaine. Toxicity of Arsenic, Molybdenum and Selenium Combinations to Ceroidaphnia dubia. Environ. Toxicol. Chem.14(2): 329-336.
Arsenic oxide	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	955	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic pentoxide	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	932	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic pentoxide	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	3000		NC	ug/L	LAB	1999. Chen, C.Y., K.B. Sillett, C.L. Folt, S.L. Whittemore, and A. Barchowsky. Molecular and Demographic Measures of Arsenic Stress in Daphnia pulex. Hydrobiologia401: 229-238.
Arsenic pentoxide	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	3000		NC	ug/L	LAB	1999. Chen, C.Y., K.B. Sillett, C.L. Folt, S.L. Whittemore, and A. Barchowsky. Molecular and Demographic Measures of Arsenic Stress in Daphnia pulex. Hydrobiologia401: 229-238.
Arsenic acid (H3AsO4), Sodium salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	1140	NA	NR	ug/L	LAB	1995. Naddy, R.B., T.W. LaPoint, and S.J. Klaine. Toxicity of Arsenic, Molybdenum and Selenium Combinations to Ceroidaphnia dubia. Environ. Toxicol. Chem.14(2): 329-336.
Arsenic oxide	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	10		NC	ug/L	LAB	2007. Martins, J.C., M.L. Saker, L.F. Oliva Teles, and V.M. Vasconcelos. Oxygen Consumption by Daphnia magna Straus as a Marker of Chemical Stress in the Aquatic Environment. Environ. Toxicol. Chem.26(9): 1987-1991.
Arsenic pentoxide	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	1000		NC	ug/L	LAB	1999. Chen, C.Y., K.B. Sillett, C.L. Folt, S.L. Whittemore, and A. Barchowsky. Molecular and Demographic Measures of Arsenic Stress in Daphnia pulex. Hydrobiologia401: 229-238.
Arsenic acid (H3AsO4), Disodium salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	1400	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Arsenic acid (H3AsO4), Disodium salt	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Maeda, S., R. Inoue, T. Kozono, T. Tokuda, A. Ohki, and T. Takeshita. Arsenic Metabolism in a Freshwater Food Chain. Chemosphere20(1-2): 101-108.
Arsenic acid (H3AsO4), Sodium salt	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Naddy, R.B., T.W. LaPoint, and S.J. Klaine. Toxicity of Arsenic, Molybdenum and Selenium Combinations to Ceroidaphnia dubia. Environ. Toxicol. Chem.14(2): 329-336.
Arsenic oxide	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	955	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic pentoxide	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	932	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic oxide	Water Mite Family	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1931. Surber, E.W., and O.L. Meehean. Lethal Concentrations of Arsenic for Certain Aquatic Organisms. Trans. Am. Fish. Soc.61: 225-239.

Table B-3. Summary of Results from the EcoTox Database for Invertebrates - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Disodium salt	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	510000*	NA	NR	ug/L	LAB	1970. Mitsuhashi, J., T.D.C. Grace, and D.F. Waterhouse. Effects of Insecticides on Cultures of Insect Cells. Entomol. Exp. Appl.13: 327-341.

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Table B-4. Summary of Results from the EcoTox Database for Invertebrates - Barium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Barium	Amphipod	Crustaceans	Fresh	Mortality	LC50		A	NR			ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Barium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	39000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Barium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	43000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Barium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	46000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Barium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	59000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Barium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	61000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Barium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	78000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Barium nitrate	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2710	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.
Barium chloride	Freshwater Sponge	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	mM	LAB	1978. Ostrom, K.M., and T.L. Simpson. Calcium and the Release From Dormancy of Freshwater Sponge Gemmules. Dev. Biol.64: 332-338.
Barium chloride	Freshwater Sponge	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	1	NA	NR	mM	LAB	1978. Ostrom, K.M., and T.L. Simpson. Calcium and the Release From Dormancy of Freshwater Sponge Gemmules. Dev. Biol.64: 332-338.
Barium nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2.8	L	2.69	mM	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Barium nitrate	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Barium chloride	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Barium nitrate	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	F	2710	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.
Barium chloride	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	336000	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Barium chloride	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	258000	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Barium chloride	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	162000	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Barium chloride	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	122000	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Barium chloride	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3980000	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.

Table B-4. Summary of Results from the EcoTox Database for Invertebrates - Barium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Barium chloride	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	395000	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Barium chloride	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	255000	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Barium chloride	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	238000	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Barium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	410000	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Barium	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	68000	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Barium chloride	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	8900	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.

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Table B-5. Summary of Results from the EcoTox Database for Invertebrates - Beryllium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Beryllium	Amphipod	Crustaceans	Fresh	Mortality	LC50		AN	240			ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Beryllium sulfate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	40000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Beryllium sulfate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Beryllium sulfate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Beryllium sulfate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Beryllium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Beryllium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Beryllium chloride	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	700*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Growth	MATC	Not Reported	T	1100	NA	NR	ug/L	LAB	1986. Buikema, A.L.,Jr.. Toxicity of Beryllium to the Cladoceran, Daphnia magna as a Function of Water Hardness. Dep.of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA: 26 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	141	NA	NR	ug/L	LAB	1986. Buikema, A.L.,Jr.. Toxicity of Beryllium to the Cladoceran, Daphnia magna as a Function of Water Hardness. Dep.of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA: 26 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	141	NA	NR	ug/L	LAB	1986. Buikema, A.L.,Jr.. Toxicity of Beryllium to the Cladoceran, Daphnia magna as a Function of Water Hardness. Dep.of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA: 26 p..
Beryllium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1900	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Beryllium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Beryllium chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2410	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2450	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3070	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3460	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	34	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1250	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	820	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	2150	NA	NR	ug/L	LAB	1986. Buikema, A.L.,Jr.. Toxicity of Beryllium to the Cladoceran, Daphnia magna as a Function of Water Hardness. Dep.of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA: 26 p..
Beryllium	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	250	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Beryllium chloride	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Lebedeva, G.D.. The Effect of Beryllium on Aquatic Organisms. Zool. Zh.39: 1779-1782.

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Table B-5. Summary of Results from the EcoTox Database for Invertebrates - Beryllium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	141	NA	NR	ug/L	LAB	1986. Buikema, A.L.,Jr.. Toxicity of Beryllium to the Cladoceran, Daphnia magna as a Function of Water Hardness. Dep.of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA: 26 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5870	NA	NR	ug/L	LAB	1986. Buikema, A.L.,Jr.. Toxicity of Beryllium to the Cladoceran, Daphnia magna as a Function of Water Hardness. Dep.of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA: 26 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	108.1	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	7.3	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	2150	NA	NR	ug/L	LAB	1986. Buikema, A.L.,Jr.. Toxicity of Beryllium to the Cladoceran, Daphnia magna as a Function of Water Hardness. Dep.of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA: 26 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	288	NA	NR	ug/L	LAB	1986. Buikema, A.L.,Jr.. Toxicity of Beryllium to the Cladoceran, Daphnia magna as a Function of Water Hardness. Dep.of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA: 26 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	51	NA	NR	ug/L	LAB	1986. Buikema, A.L.,Jr.. Toxicity of Beryllium to the Cladoceran, Daphnia magna as a Function of Water Hardness. Dep.of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA: 26 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	5.3	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3.8	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium chloride	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Lebedeva, G.D.. The Effect of Beryllium on Aquatic Organisms. Zool. Zh.39: 1779-1782.
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	3.8	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	7.3	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..

Table B-6. Summary of Results from the EcoTox Database for Invertebrates - Boron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Boron	Amphipod	Crustaceans	Fresh	Mortality	LC50		A	NR			ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Boron sodium oxide (B4Na2O7)	Midge	Insects/Spiders	Fresh	Growth	NR		T	20000	NA	NR	ug/L	LAB	1991. Maier, K.J., and A.W. Knight. The Toxicity of Waterborne Boron to Daphnia magna and Chironomus decorus and the Effects of Water Hardness and Sulfate on Boron Toxicity. Arch. Environ. Contam. Toxicol.20(2): 282-287.
Boron sodium oxide (B4Na2O7)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1376000	NR	NR	ug/L	LAB	1990. Maier, K.J.. The Toxicity and Bioaccumulation of Selenium and Boron to Daphnia magna and Chironomus decorus. Ph.D.Thesis, Univ.of California, Davis, CA: 191 p..
Boron sodium oxide (B4Na2O7)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1376000	NA	NR	ug/L	LAB	1991. Maier, K.J., and A.W. Knight. The Toxicity of Waterborne Boron to Daphnia magna and Chironomus decorus and the Effects of Water Hardness and Sulfate on Boron Toxicity. Arch. Environ. Contam. Toxicol.20(2): 282-287.
Boric acid (H3BO3)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5825000	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Boric acid (H3BO3)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	4871000	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Boron	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2935	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Growth	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Gersich, F.M., and D.P. Milazzo. Evaluation of a 14-Day Static Renewal Toxicity Test with Daphnia magna Straus. Arch. Environ. Contam. Toxicol.19(1): 72-76.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Growth	MATC	Not Reported	T	9330	NA	NR	ug/L	LAB	1985. Gersich, F.M., D.L. Hopkins, S.L. Applegath, C.G. Mendoza, and D.P. Milazzo. The Sensitivity of Chronic Endpoints Used in Daphnia magna Straus Life-Cycle Tests. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 245-252.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	6400	NA	NR	ug/L	LAB	1985. Gersich, F.M., D.L. Hopkins, S.L. Applegath, C.G. Mendoza, and D.P. Milazzo. The Sensitivity of Chronic Endpoints Used in Daphnia magna Straus Life-Cycle Tests. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 245-252.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	13600	NA	NR	ug/L	LAB	1985. Gersich, F.M., D.L. Hopkins, S.L. Applegath, C.G. Mendoza, and D.P. Milazzo. The Sensitivity of Chronic Endpoints Used in Daphnia magna Straus Life-Cycle Tests. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 245-252.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	27000	NA	NR	ug/L	LAB	1981. Lewis, M.A., and L.C. Valentine. Acute and Chronic Toxicities of Boric Acid to Daphnia magna Straus. Bull. Environ. Contam. Toxicol.27(3): 309-315.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	53000	NA	NR	ug/L	LAB	1981. Lewis, M.A., and L.C. Valentine. Acute and Chronic Toxicities of Boric Acid to Daphnia magna Straus. Bull. Environ. Contam. Toxicol.27(3): 309-315.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	EC10	Not Reported	T	130400	NR	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	EC10	Not Reported	T	48800	NR	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	EC10	Not Reported	T	138800	NR	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	EC10	Not Reported	T	250000	NR	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	EC10	Not Reported	T	38100	NR	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	180600	NA	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	101200	NA	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	267700	NA	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	319800	NA	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	123400	NA	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boron sodium oxide (B4Na2O7)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	141000	NR	NR	ug/L	LAB	1990. Maier, K.J.. The Toxicity and Bioaccumulation of Selenium and Boron to Daphnia magna and Chironomus decorus. Ph.D.Thesis, Univ.of California, Davis, CA: 191 p..
Boron sodium oxide (B4Na2O7)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	141000	NA	NR	ug/L	LAB	1991. Maier, K.J., and A.W. Knight. The Toxicity of Waterborne Boron to Daphnia magna and Chironomus decorus and the Effects of Water Hardness and Sulfate on Boron Toxicity. Arch. Environ. Contam. Toxicol.20(2): 282-287.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	226000	NA	NR	ug/L	LAB	1981. Lewis, M.A., and L.C. Valentine. Acute and Chronic Toxicities of Boric Acid to Daphnia magna Straus. Bull. Environ. Contam. Toxicol.27(3): 309-315.

Table B-6. Summary of Results from the EcoTox Database for Invertebrates - Boron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	133000	NA	NR	ug/L	LAB	1984. Gersich, F.M.. Evaluation of a Static Renewal Chronic Toxicity Test Method for Daphnia magna Straus Using Boric Acid. Environ. Toxicol. Chem.3(1): 89-94.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52200	NA	NR	ug/L	LAB	1984. Gersich, F.M.. Evaluation of a Static Renewal Chronic Toxicity Test Method for Daphnia magna Straus Using Boric Acid. Environ. Toxicol. Chem.3(1): 89-94.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	53200	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	53200	NA	NR	ug/L	LAB	1981. Lewis, M.A., and L.C. Valentine. Acute and Chronic Toxicities of Boric Acid to Daphnia magna Straus. Bull. Environ. Contam. Toxicol.27(3): 309-315.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Gersich, F.M., and D.P. Milazzo. Evaluation of a 14-Day Static Renewal Toxicity Test with Daphnia magna Straus. Arch. Environ. Contam. Toxicol.19(1): 72-76.
Boron sodium oxide (B4Na2O7)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	141000	NR	NR	ug/L	LAB	1990. Maier, K.J.. The Toxicity and Bioaccumulation of Selenium and Boron to Daphnia magna and Chironomus decorus. Ph.D.Thesis, Univ.of California, Davis, CA: 191 p..
Boron sodium oxide (B4Na2O7)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	141000	NR	NR	ug/L	LAB	1990. Maier, K.J.. The Toxicity and Bioaccumulation of Selenium and Boron to Daphnia magna and Chironomus decorus. Ph.D.Thesis, Univ.of California, Davis, CA: 191 p..
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	29400	NA	NR	ug/L	LAB	1985. Gersich, F.M., D.L. Hopkins, S.L. Applegath, C.G. Mendoza, and D.P. Milazzo. The Sensitivity of Chronic Endpoints Used in Daphnia magna Straus Life-Cycle Tests. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 245-252.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	59300	NA	NR	ug/L	LAB	1985. Gersich, F.M., D.L. Hopkins, S.L. Applegath, C.G. Mendoza, and D.P. Milazzo. The Sensitivity of Chronic Endpoints Used in Daphnia magna Straus Life-Cycle Tests. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 245-252.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	18000	NA	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	32000	NA	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	13400	NA	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Gersich, F.M., and D.P. Milazzo. Evaluation of a 14-Day Static Renewal Toxicity Test with Daphnia magna Straus. Arch. Environ. Contam. Toxicol.19(1): 72-76.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	9330	NA	NR	ug/L	LAB	1984. Gersich, F.M.. Evaluation of a Static Renewal Chronic Toxicity Test Method for Daphnia magna Straus Using Boric Acid. Environ. Toxicol. Chem.3(1): 89-94.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	9330	NA	NR	ug/L	LAB	1985. Gersich, F.M., D.L. Hopkins, S.L. Applegath, C.G. Mendoza, and D.P. Milazzo. The Sensitivity of Chronic Endpoints Used in Daphnia magna Straus Life-Cycle Tests. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 245-252.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	24000	NA	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10000	NA	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	6000	NA	NR	ug/L	LAB	1981. Lewis, M.A., and L.C. Valentine. Acute and Chronic Toxicities of Boric Acid to Daphnia magna Straus. Bull. Environ. Contam. Toxicol.27(3): 309-315.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	18000	NA	NR	ug/L	LAB	1989. Hickey, C.W.. Sensitivity of Four New Zealand Cladoceran Species and Daphnia magna to Aquatic Toxicants. N. Z. J. Mar. Freshw. Res.23(1): 131-137.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	6400	NA	NR	ug/L	LAB	1985. Gersich, F.M., D.L. Hopkins, S.L. Applegath, C.G. Mendoza, and D.P. Milazzo. The Sensitivity of Chronic Endpoints Used in Daphnia magna Straus Life-Cycle Tests. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 245-252.
Boric acid (H3BO3)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	13600	NA	NR	ug/L	LAB	1985. Gersich, F.M., D.L. Hopkins, S.L. Applegath, C.G. Mendoza, and D.P. Milazzo. The Sensitivity of Chronic Endpoints Used in Daphnia magna Straus Life-Cycle Tests. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 245-252.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Alderfly	Insects/Spiders	Fresh	Growth	NR	ultiple Tissue/Orga	T	10	NR	NR	nM	LAB	1999. Roy, I., and L. Hare. Relative Importance of Water and Food as Cadmium Sources to the Predatory Insect Sialis velata (Megaloptera). Can. J. Fish. Aquat. Sci.56(4): 1143-1149.
Cadmium chloride (CdCl2)	Alderfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	18000000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium	American Or Virginia Oyster	Molluscs	NR	Growth	NR		T	100	NA	NR	ug/L	LAB	1979. Keeney, M.. Biochemical and Nutritional Interactions between the Oyster (Crassostrea virginica Gmelin) and its Environment. University of Maryland, College Park, MD: 5 p..
Cadmium	American Or Virginia Oyster	Molluscs	NR	Growth	NR		T	250	NA	NR	ug/L	LAB	1979. Keeney, M.. Biochemical and Nutritional Interactions between the Oyster (Crassostrea virginica Gmelin) and its Environment. University of Maryland, College Park, MD: 5 p..
Cadmium	American Or Virginia Oyster	Molluscs	NR	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Keeney, M.. Biochemical and Nutritional Interactions between the Oyster (Crassostrea virginica Gmelin) and its Environment. University of Maryland, College Park, MD: 5 p..
Cadmium chloride (CdCl2)	Amoeba	Invertebrates	NR	Mortality	LC80*	Not Reported	T	20000*	NA	NR	ug/L	LAB	1980. Al Atia, G.R.. Toxicity of Cadmium to Amoeba proteus: A Biochemical Approach. J.Protozool.27(1): 128-132.
Cadmium	Amoeba	Invertebrates	Fresh	Mortality	NR	Not Reported	T	0.0002	NR	NR	M	LAB	1978. Al Atia, G.R.. The Uptake and Toxicity of Cadmium in Amoeba proteus. J.Protozool.25: 5B.
Cadmium	Amoeba	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1978. Al Atia, G.R.. The Uptake and Toxicity of Cadmium in Amoeba proteus. J.Protozool.25: 5B.
Cadmium	Amoeba	Invertebrates	Fresh	Mortality	NR	Not Reported	T	1E-08	NR	NR	M	LAB	1978. Al Atia, G.R.. The Uptake and Toxicity of Cadmium in Amoeba proteus. J.Protozool.25: 5B.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	480	NR	NR	ug/L	LAB	1996. Martinez, M., J. Del Ramo, A. Torreblanca, A. Pastor, and J. Diaz-Mayans. Cadmium Toxicity, Accumulation and Metallothionein Induction in Echinogammarus echinosetosus. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control31(7): 1605-1617.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1997. Pantani, C., G. Pannunzio, M. De Cristofaro, A.A. Novelli, and M. Salvatori. Comparative Acute Toxicity of Some Pesticides, Metals, and Surfactants to Gammarus italicus Goedm. and Echinogammarus tibaldii Pink. and Stock (Crustacea: Amphipoda). Bull. Environ. Contam. Toxicol.59(6): 963-967.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	4340	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	9140	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	1080	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	2340	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	2650	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	630	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	920	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	1640	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	2180	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	530	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	720	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	980	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	1480	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	410	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	470	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Amphipod	Crustaceans	NR	Mortality	LC50	Not Reported	T	760	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium	Amphipod	Crustaceans	Fresh	Mortality	LC50		AM	1.6			ug/L	LAB	. . . .
Sulfuric acid, Cadmium salt (1:1)	Annelid Worm Class	Worms	Fresh	Mortality	LC50	Not Reported	T	580	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Effects of Species Interactions on the Survival and Respiration of Limnodrilus hoffmeisteri and Tubifex tubifex (Oligochaeta, Tubificidae) Exposed to Various Pollutants and Enironmental Factors. Water Res.16(9): 1405-1408.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Growth	NR		T	2.70*	NA	NR	ug/L	LAB	1987. De Nicola Guidici, M., L. Migliore, and S.M. Guarino. Sensitivity of Asellus aquaticus (L.) and Proasellus coxalis Dollf. (Crustacea, Isopoda) to Copper. Hydrobiologia146: 63-69.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	NR	Growth	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1988. De Nicola Guidici, M., and L. Migliore. Long Term Effect of Cadmium or Copper on Asellus aquaticus (L.) (Crustacea, Isopoda). Ver. Int. Verh. Limnol.23(3): 1660-1662.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	53.8	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	75.8	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46.4	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	61	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3600	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38.7	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	49	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36.9	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	42	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32.4	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38.6	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	175	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	450	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	53	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	540	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1986. Green, D.W.J., K.A. Williams, and D. Pascoe. The Acute and Chronic Toxicity of Cadmium to Different Life History Stages of the Freshwater Crustacean Asellus aquaticus (L). Arch. Environ. Contam. Toxicol.15(5): 465-471.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28.7	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33.2	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	87.8	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	96.8	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11000	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12000	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12000	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9000	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2200	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2500	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3700	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4000	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	560	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	560	NR	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1981. Bosnak, A.D., and E.L. Morgan. Acute Toxicity of Cadmium, Zinc, and Total Residual Chlorine to Epigean and Hypogean Isopods (Asellidae). Natl. Speleological Soc. Bull.43: 12-18.
Cadmium chloride (CdCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1981. Bosnak, A.D., and E.L. Morgan. Acute Toxicity of Cadmium, Zinc, and Total Residual Chlorine to Epigean and Hypogean Isopods (Asellidae). Natl. Speleological Soc. Bull.43: 12-18.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15320	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	78450	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	85000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	861	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	189.8	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	206.3	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31380	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8034.8	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Nitric acid, Cadmium salt	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	238*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	15320	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	78450	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	85000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	861	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	1898	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	206.3	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	31380	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	8034.8	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	200000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	500	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	15320	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	78450	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	85000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	861	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	1898	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	206.3	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	31380	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	8034.8	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2.70*	NA	NR	ug/L	LAB	1987. De Nicola Guidici, M., L. Migliore, and S.M. Guarino. Sensitivity of Asellus aquaticus (L.) and Proasellus coxalis Dollf. (Crustacea, Isopoda) to Copper. Hydrobiologia146: 63-69.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	NR	Mortality	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1988. De Nicola Guidici, M., and L. Migliore. Long Term Effect of Cadmium or Copper on Asellus aquaticus (L.) (Crustacea, Isopoda). Ver. Int. Verh. Limnol.23(3): 1660-1662.
Sulfuric acid, Cadmium salt (1:1)	Aquatic Sowbug	Crustaceans	NR	Reproduction	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1988. De Nicola Guidici, M., and L. Migliore. Long Term Effect of Cadmium or Copper on Asellus aquaticus (L.) (Crustacea, Isopoda). Ver. Int. Verh. Limnol.23(3): 1660-1662.
Cadmium chloride (CdCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	0.13		NC	uM	LAB	2006. Achard-Joris, M., P. Gonzalez, V. Marie, M. Baudrimont, and J.P. Bourdineaud. Cytochrome C Oxydase Subunit I Gene is Up-Regulated by Cadmium in Freshwater and Marine Bivalves. Biometals19(3): 237-244.
Cadmium chloride (CdCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	0.133		NC	uM	LAB	2006. Marie, V., P. Gonzalez, M. Baudrimont, J.P. Bourdineaud, and A. Boudou. Metallothionein Response to Cadmium and Zinc Exposures Compared in Two Freshwater Bivalves, Dreissena polymorpha and Corbicula fluminea. Biometals19(4): 399-407.
Cadmium chloride (CdCl2)	Backswimmer	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	FIELDN	1997. Koivisto, S., M. Arner, and N. Kautsky. Does Cadmium Pollution Change Trophic Interactions in Rockpool Food Webs?. Environ. Toxicol. Chem.16(6): 1330-1336.
Cadmium	Baltic Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6000	NR	NR	ug/L	LAB	1993. Papoutsoglou, S.E., and D. Abel. Studies on the Lethal and Sublethal Effects of Cadmium on Some Commercially Cultured Species of the Mediterranean. In: Final Reports on Projects (Activity G), UNEP, Athens, Greece, MAP Tech.Rep.Ser.No.48: 33-43.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Banded Mystery Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	T	48.2	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.
Cadmium chloride (CdCl2)	Banded Mystery Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	T	48.2	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.
Cadmium chloride (CdCl2)	Banded Mystery Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	T	48.2	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.
Cadmium chloride (CdCl2)	Banded Mystery Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.
Cadmium chloride (CdCl2)	Banded Mystery Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.
Cadmium chloride (CdCl2)	Banded Mystery Snail	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Tessier, L., G. Vaillancourt, and L. Pazdernik. Laboratory Study of Cd and Hg Uptake by Two Freshwater Molluscs in Relation to Concentration, Age and Exposure Time. Water Air Soil Pollut.86(1-4): 347-357.
Cadmium chloride (CdCl2)	Banded Mystery Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Tessier, L., G. Vaillancourt, and L. Pazdernik. Laboratory Study of Cd and Hg Uptake by Two Freshwater Molluscs in Relation to Concentration, Age and Exposure Time. Water Air Soil Pollut.86(1-4): 347-357.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Growth	LOEL	Whole Organism	T	50000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Growth	NOEL	Whole Organism	T	10000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Growth	NR	Whole Organism	T	100000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Growth	NR	Whole Organism	T	100000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Growth	NR	Whole Organism	T	100000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Growth	NR	Whole Organism	T	100000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Growth	NR	Whole Organism	T	100000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	111000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	36000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	15100		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	26300		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	13200		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	5850		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Nitric acid, Cadmium salt	Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2.7	NA	NR	ug/L	LAB	1986. Abraham, T.J., K.Y.M. Salih, and J. Chacko. Effects of Heavy Metals on the Filtration Rate of Bivalve Villorita cyprinoides (Hanley) var. cochinensis. Indian J. Mar. Sci.15(3): 195-196.
Cadmium	Bladder Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4200	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Bladder Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4400	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Bladder Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Bladder Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Bladder Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Bladder Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	19000	NA	NR	ug/L	LAB	1991. Guerin, J.L., and W.B. Stickle. The Effects of Cadmium on the Survival and Bioenergetics of Juvenile Blue Crabs (Callinectes sapidus) at Different Salinities. Am. Zool.31(5): 113A.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1250	NA	NR	ug/L	LAB	1979. Frank, P.M., and P.B. Robertson. The Influence of Salinity on Toxicity of Cadmium and Chromium to the Blue Crab, Callinectes sapidus. Bull. Environ. Contam. Toxicol.21(1-2): 74-78.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	900	NA	NR	ug/L	LAB	1979. Frank, P.M., and P.B. Robertson. The Influence of Salinity on Toxicity of Cadmium and Chromium to the Blue Crab, Callinectes sapidus. Bull. Environ. Contam. Toxicol.21(1-2): 74-78.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	650	NA	NR	ug/L	LAB	1979. Frank, P.M., and P.B. Robertson. The Influence of Salinity on Toxicity of Cadmium and Chromium to the Blue Crab, Callinectes sapidus. Bull. Environ. Contam. Toxicol.21(1-2): 74-78.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1979. Frank, P.M., and P.B. Robertson. The Influence of Salinity on Toxicity of Cadmium and Chromium to the Blue Crab, Callinectes sapidus. Bull. Environ. Contam. Toxicol.21(1-2): 74-78.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Blue Crab	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Guerin, J.L., and W.B. Stickle. Effects of Cadmium on Survival, Osmoregulatory Ability and Bioenergetics of Juvenile Blue Crabs Callinectes sapidus at Different Salinities. Mar. Environ. Res.40(3): 227-246.
Cadmium chloride (CdCl2)	Broad Winged Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	8000000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Broad Winged Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Broad Winged Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1500000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Nitric acid, Cadmium salt	Brown Gardensnail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Laskowski, R., and S.P. Hopkin. Effect of Zn, Cu, Pb and Cd on Fitness in Snails (Helix aspersa). Ecotoxicol. Environ. Saf.34(1): 59-69.
Nitric acid, Cadmium salt	Brown Gardensnail	Molluscs	Fresh	Reproduction	EC50	Not Reported	T	183000	NR	NR	ug/L	LAB	1996. Laskowski, R., and S.P. Hopkin. Effect of Zn, Cu, Pb and Cd on Fitness in Snails (Helix aspersa). Ecotoxicol. Environ. Saf.34(1): 59-69.
Cadmium chloride (CdCl2)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	740		NC	ug/L	LAB	1998. Safadi, R.S.. The Use of Freshwater Planarians in Acute Toxicity Tests with Heavy Metals. Verh. Int. Ver. Limnol.26(5): 2391-2392.
Cadmium	Bryozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Cadmium	Bryozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Cadmium	Bryozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1090	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Sulfuric acid, Cadmium salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Vuori, K.M.. Rapid Behavioural and Morphological Reponses of Hydropsychid Larvae (Trichoptera, Hydropsychidae) to Sublethal Cadmium Exposure. Environ. Pollut.84(3): 291-299.
Sulfuric acid, Cadmium salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Vuori, K.M.. Rapid Behavioural and Morphological Reponses of Hydropsychid Larvae (Trichoptera, Hydropsychidae) to Sublethal Cadmium Exposure. Environ. Pollut.84(3): 291-299.
Cadmium	Caddisfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	520000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium chloride (CdCl2)	Caddisfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1100000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Caddisfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	650000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Caddisfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Caddisfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects. Environ. Res.9(3): 285-289.
Cadmium	Caddisfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects. Environ. Res.9(3): 285-289.
Cadmium chloride (CdCl2)	Caddisfly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	42500	NR	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Acute Cadmium Toxicity Studies upon Nine Species of Aquatic Insects. Environ. Res.9: 332-341.
Cadmium	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	5100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	3400	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium chloride (CdCl2)	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6310	NR	NR	ug/L	LAB	1994. Das, B.K., and A. Kaviraj. Individual and Interactive Lethal Toxicity of Cadmium, Potassium Permanganate and Cobalt Chloride to Fish, Worm and Plankton. Geobios21(4): 223-227.
Sulfuric acid, Cadmium salt (1:1)	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Cadmium salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2996	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3046	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3093	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3450	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4900	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5700	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Sulfuric acid, Cadmium salt (1:1)	Calanoid Copepod	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	45	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Calanoid Copepod	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	25	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Chigger, Tick, Mite Subclass	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2925000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Chigger, Tick, Mite Subclass	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1444700	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Chigger, Tick, Mite Subclass	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1725000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Chigger, Tick, Mite Subclass	Insects/Spiders	Fresh	Mortality	LD0	Not Reported	T	1000000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Chigger, Tick, Mite Subclass	Insects/Spiders	Fresh	Mortality	LD0	Not Reported	T	50000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Chigger, Tick, Mite Subclass	Insects/Spiders	Fresh	Mortality	LD100	Not Reported	T	5000000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Chigger, Tick, Mite Subclass	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	2925000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Chigger, Tick, Mite Subclass	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	1444700	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Chigger, Tick, Mite Subclass	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	1725000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Cadmium chloride (CdCl2)	Chironomid	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1990. Heinis, F., K.R. Timmermans, and W.R. Swain. Short-Term Sublethal Effects of Cadmium on the Filter Feeding Chironomid Larva Glyptotendipes pallens (Meigen) (Diptera). Aquat. Toxicol.16(1): 73-86.
Cadmium chloride (CdCl2)	Chironomid	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Heinis, F., K.R. Timmermans, and W.R. Swain. Short-Term Sublethal Effects of Cadmium on the Filter Feeding Chironomid Larva Glyptotendipes pallens (Meigen) (Diptera). Aquat. Toxicol.16(1): 73-86.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Chironomid	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Heinis, F., K.R. Timmermans, and W.R. Swain. Short-Term Sublethal Effects of Cadmium on the Filter Feeding Chironomid Larva Glyptotendipes pallens (Meigen) (Diptera). Aquat. Toxicol.16(1): 73-86.
Cadmium	Chiton	Molluscs	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Tyurin, A.N., and N.K. Khristoforova. Effect of Toxicants on the Development of the Chiton Ischnochiton hakodadensis. Russ.J.Mar.Biol.19(5/6):100-106 / Biol.Morya5-6: 100-106.
Cadmium	Chiton	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	100	NA	NR	ug/L	LAB	1993. Tyurin, A.N., and N.K. Khristoforova. Effect of Toxicants on the Development of the Chiton Ischnochiton hakodadensis. Russ.J.Mar.Biol.19(5/6):100-106 / Biol.Morya5-6: 100-106.
Cadmium chloride (CdCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2210	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Cadmium chloride (CdCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	205	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Cadmium chloride (CdCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	890	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Cadmium chloride (CdCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Cadmium chloride (CdCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2660	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Cadmium chloride (CdCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3750	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Cadmium chloride (CdCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5550	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Cadmium chloride (CdCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Cadmium chloride (CdCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Cadmium chloride (CdCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3810	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Cadmium chloride (CdCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3240	NR	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Sulfuric acid, Cadmium salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LETC	Not Reported	T	900*	NA	NR	ug/L	LAB	1973. Carter, J.W., and I.L. Cameron. Toxicity Bioassay of Heavy Metals in Water Using Tetrahymena-pyriformis. Water Res.7(7): 951-961.
Cadmium chloride (CdCl2)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	230	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Cadmium chloride (CdCl2)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	300	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Cadmium chloride (CdCl2)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	2000	NA	NR	ug/L	LAB	1994. Schlenk, D., and C.T. Moore. Effect of pH and Time on the Acute Toxicity of Copper Sulfate to the Ciliate Protozoan Tetrahymena thermophila. Bull. Environ. Contam. Toxicol.53(6): 800-804.
Cadmium chloride (CdCl2)	Ciliate Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	520	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Cadmium chloride (CdCl2)	Ciliated Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1950	NR	NR	ug/L	LAB	1998. Twagilimana, L., J. Bohatier, CA Groliere, F. Bonnemoy, and D. Sargos. A New Low-Cost Microbiotest with the Protozoan Spirostomum teres: Culture Conditions and Assessment of Sensitivity of the Ciliate to 14 Pure Chemicals. Ecotoxicol. Environ. Saf.41(3): 231-244.
Cadmium chloride (CdCl2)	Ciliated Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	557	NA	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Cadmium chloride (CdCl2)	Cladoceran	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	345	NA	NR	ug/L	LAB	1988. Chandini, T.. Changes in Food [Chlorella] Levels and the Acute Toxicity of Cadmium to Daphnia carinata (Daphnidae) and Echinisca triserialis (Macrothricidae)(Crustacea: Cladocera). Bull. Environ. Contam. Toxicol.41(3): 398-403.
Cadmium chloride (CdCl2)	Cladoceran	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	370	NA	NR	ug/L	LAB	1988. Chandini, T.. Changes in Food [Chlorella] Levels and the Acute Toxicity of Cadmium to Daphnia carinata (Daphnidae) and Echinisca triserialis (Macrothricidae)(Crustacea: Cladocera). Bull. Environ. Contam. Toxicol.41(3): 398-403.
Cadmium chloride (CdCl2)	Cladoceran	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1988. Chandini, T.. Changes in Food [Chlorella] Levels and the Acute Toxicity of Cadmium to Daphnia carinata (Daphnidae) and Echinisca triserialis (Macrothricidae)(Crustacea: Cladocera). Bull. Environ. Contam. Toxicol.41(3): 398-403.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Cladoceran	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1988. Chandini, T.. Changes in Food [Chlorella] Levels and the Acute Toxicity of Cadmium to Daphnia carinata (Daphnidae) and Echinisca triserialis (Macrothricidae)(Crustacea: Cladocera). Bull. Environ. Contam. Toxicol.41(3): 398-403.
Cadmium chloride (CdCl2)	Cladoceran	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1988. Chandini, T.. Changes in Food [Chlorella] Levels and the Acute Toxicity of Cadmium to Daphnia carinata (Daphnidae) and Echinisca triserialis (Macrothricidae)(Crustacea: Cladocera). Bull. Environ. Contam. Toxicol.41(3): 398-403.
Cadmium chloride (CdCl2)	Cladoceran	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1988. Chandini, T.. Changes in Food [Chlorella] Levels and the Acute Toxicity of Cadmium to Daphnia carinata (Daphnidae) and Echinisca triserialis (Macrothricidae)(Crustacea: Cladocera). Bull. Environ. Contam. Toxicol.41(3): 398-403.
Cadmium chloride (CdCl2)	Cladoceran	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1991. Chandini, T.. Reproductive Value and the Cost of Reproduction in Daphnia carinata and Echinisca triserialis (Crustacea: Cladocera) Exposed to Food and Cadmium Stress. Bull. Environ. Contam. Toxicol.47(1): 76-83.
Cadmium	Clam	Molluscs	NR	Mortality	LC5	Not Reported	T	960	NA	NR	ug/L	LAB	1983. Kulkarni, K.M.. Accumulation of Copper, Zinc and Cadmium in the Clam Puphia textile. Environ. Ecol.1(3): 197-199.
Sulfuric acid, Cadmium salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	4900	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Sulfuric acid, Cadmium salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	1590	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Sulfuric acid, Cadmium salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	1050	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Sulfuric acid, Cadmium salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	930	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Cadmium	Clam	Molluscs	NR	Mortality	LC95	Not Reported	T	2350	NA	NR	ug/L	LAB	1983. Kulkarni, K.M.. Accumulation of Copper, Zinc and Cadmium in the Clam Puphia textile. Environ. Ecol.1(3): 197-199.
Cadmium	Cockle	Molluscs	NR	Mortality	LD50	Not Reported	T	10000	NA	NR	ug/L	LAB	1989. Buu, B., and Y. Le Gal. Cadmium Intoxication of the Common Cockle Cardium edule (Responses de la Coque Cardium edule a L'intoxication par le Cadmium). Oceanis15(4): 591-597.
Cadmium chloride (CdCl2)	Common Bay Mussel,Blue Mussel	Molluscs	NR	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1980. Breittmayer, J.P., R. Guido, and S. Tuncer. The Effect of Cadmium on the Toxicity of Mercury to the Mussel Mytilus edulis (L.). Chemosphere9(11): 725-728.
Sulfuric acid, Cadmium salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	870	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	45	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Cadmium chloride (CdCl2)	Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Cadmium chloride (CdCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1996. Onuoha, G.C., F.O. Nwadukwe, and E.S. Erondu. Comparative Toxicity of Cadmium to Crustacean Zooplankton (Copepods and Ostracods). Environ. Ecol.14(3): 557-562.
Cadmium chloride (CdCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47	NA	NR	ug/L	LAB	1996. Onuoha, G.C., F.O. Nwadukwe, and E.S. Erondu. Comparative Toxicity of Cadmium to Crustacean Zooplankton (Copepods and Ostracods). Environ. Ecol.14(3): 557-562.
Cadmium chloride (CdCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	51	NA	NR	ug/L	LAB	1996. Onuoha, G.C., F.O. Nwadukwe, and E.S. Erondu. Comparative Toxicity of Cadmium to Crustacean Zooplankton (Copepods and Ostracods). Environ. Ecol.14(3): 557-562.
Nitric acid, Cadmium salt	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	160	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Nitric acid, Cadmium salt	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Nitric acid, Cadmium salt	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	400	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Nitric acid, Cadmium salt	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	63	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Nitric acid, Cadmium salt	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	80	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Cadmium chloride (CdCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	56	NA	NR	ug/L	LAB	1996. Onuoha, G.C., F.O. Nwadukwe, and E.S. Erondu. Comparative Toxicity of Cadmium to Crustacean Zooplankton (Copepods and Ostracods). Environ. Ecol.14(3): 557-562.
Cadmium chloride (CdCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	10	NA	NR	ug/L	LAB	1996. Onuoha, G.C., F.O. Nwadukwe, and E.S. Erondu. Comparative Toxicity of Cadmium to Crustacean Zooplankton (Copepods and Ostracods). Environ. Ecol.14(3): 557-562.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Growth	NR	Leg	T	NR	NA	NR	ug/L	LAB	1994. Kanagaraj, M.K., M. Ramesh, and R. Manavalaramanujam. Inhibitory Effect of Cadmium Chloride on Limb Regeneration on a Freshwater Crab Paratelphusa hydrodromous (Herbts). J. Environ. Biol.15(1): 21-25.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	11.803	NR	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	5.902	NR	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	1.475	NR	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	0.197	NR	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	188.85	NR	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	94.426	NR	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	4.721	NR	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2.361	NR	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2690	NR	NR	ug/L	LAB	1999. Vitale, A.M., J.M. Monserrat, P. Castilho, and E.M. Rodriguez. Inhibitory Effects of Cadmium on Carbonic Anhydrase Activity and Ionic Regulation of the Estuarine Crab Chasmagnathus granulata (Decapoda, Grapsidae). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.122(1): 121-129.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	85.77	NA	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37.574	NA	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12.836	NA	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.623	NA	NR	mmol/L	LAB	1993. Victor, B.. Histopathological Progression of Hemic Neoplasms in the Tropical Crab Paratelphusa hydrodromous (Herbst) Treated with Sublethal Cadmium Chloride. Arch. Environ. Contam. Toxicol.25: 48-54.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.623	NA	NR	uM/L	LAB	1993. Victor, B.. Responses of Hemocytes and Gill Tissues to Sublethal Cadmium Chloride Poisoning in the Crab Paratelphusa hydrodromous (Herbst). Arch. Environ. Contam. Toxicol.24: 432-439.
Cadmium chloride (CdCl2)	Crab	Crustaceans	NR	Mortality	LC50	Not Reported	T	25000	NA	NR	ug/L	LAB	1994. Reddy, P.S., and A. Bhagyalakshmi. Changes in Oxidative Metabolism in Selected Tissues of the Crab (Scylla serrata) in Response to Cadmium Toxicity. Ecotoxicol. Environ. Saf.29(3): 255-264.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2004. Medesani, D.A., L.S.L. Greco, and E.M. Rodriguez. Interference of Cadmium and Copper with the Endocrine Control of Ovarian Growth, in the Estuarine Crab Chasmagnathus granulata. Aquat. Toxicol.69(2): 165-174.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2004. Medesani, D.A., L.S.L. Greco, and E.M. Rodriguez. Interference of Cadmium and Copper with the Endocrine Control of Ovarian Growth, in the Estuarine Crab Chasmagnathus granulata. Aquat. Toxicol.69(2): 165-174.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2004. Medesani, D.A., L.S.L. Greco, and E.M. Rodriguez. Interference of Cadmium and Copper with the Endocrine Control of Ovarian Growth, in the Estuarine Crab Chasmagnathus granulata. Aquat. Toxicol.69(2): 165-174.
Cadmium chloride (CdCl2)	Crab	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2004. Medesani, D.A., L.S.L. Greco, and E.M. Rodriguez. Interference of Cadmium and Copper with the Endocrine Control of Ovarian Growth, in the Estuarine Crab Chasmagnathus granulata. Aquat. Toxicol.69(2): 165-174.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1986. Mirenda, R.J.. Toxicity and Accumulation of Cadmium in the Crayfish, Orconectes virilis (Hagen). Arch. Environ. Contam. Toxicol.15(4): 401-407.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1986. Mirenda, R.J.. Toxicity and Accumulation of Cadmium in the Crayfish, Orconectes virilis (Hagen). Arch. Environ. Contam. Toxicol.15(4): 401-407.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6100	NA	NR	ug/L	LAB	1986. Mirenda, R.J.. Toxicity and Accumulation of Cadmium in the Crayfish, Orconectes virilis (Hagen). Arch. Environ. Contam. Toxicol.15(4): 401-407.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1986. Mirenda, R.J.. Toxicity and Accumulation of Cadmium in the Crayfish, Orconectes virilis (Hagen). Arch. Environ. Contam. Toxicol.15(4): 401-407.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1986. Mirenda, R.J.. Toxicity and Accumulation of Cadmium in the Crayfish, Orconectes virilis (Hagen). Arch. Environ. Contam. Toxicol.15(4): 401-407.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	83100	NR	NR	ug/L	LAB	1995. Abdelghani, A.A., Y.V. Pramar, T.K. Mandal, P.B. Tchounwou, and L. Heyer. Levels and Toxicities of Selected Inorganic and Organic Contaminants in a Swamp Environment. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes30(5): 717-731.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18700	NR	NR	ug/L	LAB	1995. Abdelghani, A.A., Y.V. Pramar, T.K. Mandal, P.B. Tchounwou, and L. Heyer. Levels and Toxicities of Selected Inorganic and Organic Contaminants in a Swamp Environment. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes30(5): 717-731.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1978. Fennikoh, K.B., H.I. Hirshfield, and T.J. Kneip. Cadmium Toxicity in Planktonic Organisms of a Freshwater Food Web. Environ. Res.15(3): 357-367.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1978. Fennikoh, K.B., H.I. Hirshfield, and T.J. Kneip. Cadmium Toxicity in Planktonic Organisms of a Freshwater Food Web. Environ. Res.15(3): 357-367.
Nitric acid, Cadmium salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7000		NC	ug/L	LAB	2006. Khan, M.A.Q., S.A. Ahmed, B. Catalin, A. Khodadoust, O. Ajayi, and M. Vaughn. Effect of Temperature on Heavy Metal Toxicity to Juvenile Crayfish, Orconectes immunis (Hagen). Environ. Toxicol.21(5): 513-520.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	20	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	220	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	50	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	400	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1979. Thorp, J.H., J.P. Giesy, and S.A. Wineriter. Effects of Chronic Cadmium Exposure on Crayfish Survival, Growth and Tolerance to Elevated Temperatures. Arch. Environ. Contam. Toxicol.8(4): 449-456.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1979. Thorp, J.H., J.P. Giesy, and S.A. Wineriter. Effects of Chronic Cadmium Exposure on Crayfish Survival, Growth and Tolerance to Elevated Temperatures. Arch. Environ. Contam. Toxicol.8(4): 449-456.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1979. Thorp, J.H., J.P. Giesy, and S.A. Wineriter. Effects of Chronic Cadmium Exposure on Crayfish Survival, Growth and Tolerance to Elevated Temperatures. Arch. Environ. Contam. Toxicol.8(4): 449-456.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1979. Thorp, J.H., J.P. Giesy, and S.A. Wineriter. Effects of Chronic Cadmium Exposure on Crayfish Survival, Growth and Tolerance to Elevated Temperatures. Arch. Environ. Contam. Toxicol.8(4): 449-456.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1986. Thorp, J.H., and S.P. Gloss. Field and Laboratory Tests on Acute Toxicity of Cadmium to Freshwater Crayfish. Bull. Environ. Contam. Toxicol.37(3): 355-361.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1986. Thorp, J.H., and S.P. Gloss. Field and Laboratory Tests on Acute Toxicity of Cadmium to Freshwater Crayfish. Bull. Environ. Contam. Toxicol.37(3): 355-361.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1986. Thorp, J.H., and S.P. Gloss. Field and Laboratory Tests on Acute Toxicity of Cadmium to Freshwater Crayfish. Bull. Environ. Contam. Toxicol.37(3): 355-361.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1986. Thorp, J.H., and S.P. Gloss. Field and Laboratory Tests on Acute Toxicity of Cadmium to Freshwater Crayfish. Bull. Environ. Contam. Toxicol.37(3): 355-361.
Cadmium chloride (CdCl2)	Crayfish	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	3200	NA	NR	ug/L	LAB	1986. Thorp, J.H., and S.P. Gloss. Field and Laboratory Tests on Acute Toxicity of Cadmium to Freshwater Crayfish. Bull. Environ. Contam. Toxicol.37(3): 355-361.
Cadmium chloride (CdCl2)	Creeping Water Bug	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	12000000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Sulfuric acid, Cadmium salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46120	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.5	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	46120	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	0.5	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	100000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	5000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	46120	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	0.5	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Cadmium chloride (CdCl2)	Cyclopoids	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDN	1997. Koivisto, S., M. Arner, and N. Kautsky. Does Cadmium Pollution Change Trophic Interactions in Rockpool Food Webs?. Environ. Toxicol. Chem.16(6): 1330-1336.
Cadmium chloride (CdCl2)	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6500000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2900000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	650000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	10660	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7050	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	8660	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Sulfuric acid, Cadmium salt (1:1)	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	23300	NA	NR	ug/L	LAB	1974. Thorp, V.J., and P.S. Lake. Toxicity Bioassays of Cadmium on Selected Freshwater Invertebrates and the Interaction of Cadmium and Zinc on the Freshwater Shrimp, Paratya. Aust. J. Mar. Freshw. Res.25(1): 97-104.
Cadmium	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	11000	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	8100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium	Diptera	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects. Environ. Res.9(3): 285-289.
Cadmium	Diptera	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects. Environ. Res.9(3): 285-289.
Cadmium chloride (CdCl2)	Diptera	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	10000	NR	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Acute Cadmium Toxicity Studies upon Nine Species of Aquatic Insects. Environ. Res.9: 332-341.
Cadmium chloride (CdCl2)	Diptera	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Acute Cadmium Toxicity Studies upon Nine Species of Aquatic Insects. Environ. Res.9: 332-341.
Cadmium chloride (CdCl2)	Dragonfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1978. Fennikoh, K.B., H.I. Hirshfield, and T.J. Kneip. Cadmium Toxicity in Planktonic Organisms of a Freshwater Food Web. Environ. Res.15(3): 357-367.
Cadmium chloride (CdCl2)	Dragonfly	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	2.232	NR	NR	mM	LAB	2009. Tollett, V.D., E.L. Benvenutti, L.A. Deer, and T.M. Rice. Differential Toxicity to Cd, Pb, and Cu in Dragonfly Larvae (Insecta: Odonata). Arch. Environ. Contam. Toxicol.56(1): 77-84.
Cadmium	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	7200	NR	NR	ug/L	LAB	1994. Willuhn, J., H.P. Schmitt-Wrede, H. Greven, and F. Wunderlich. cDNA Cloning of a Cadmium-Inducible mRNA Encoding a Novel Cysteine-Rich, Non-Metallothionein 25-kDa Protein in an Enchytraeid Earthworm. J. Biol. Chem.269(40): 24688-24691.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	9000	NR	NR	ug/L	LAB	1996. Willuhn, J., A. Otto, H. Koewius, and F. Wunderlich. Subtoxic Cadmium-Concentrations Reduce Copper-Toxicity in the Earthworm Enchytraeus buchholzi. Chemosphere32(11): 2205-2210.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	6400	NA	NR	ug/L	LAB	1994. Willuhn, J., H.P. Schmitt-Wrede, H. Greven, and F. Wunderlich. Cadmium-Induced mRNA Encoding a Nonmetallothionein 33-KDa Protein in Enchytraeus buchholzi (Oligochaeta). Ecotoxicol. Environ. Saf.29: 93-100.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	8400	NA	NR	ug/L	LAB	1994. Willuhn, J., H.P. Schmitt-Wrede, H. Greven, and F. Wunderlich. Cadmium-Induced mRNA Encoding a Nonmetallothionein 33-KDa Protein in Enchytraeus buchholzi (Oligochaeta). Ecotoxicol. Environ. Saf.29: 93-100.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	1.65	NR	NR	umol/L	LAB	1995. Achazi, R.K., G. Chroszcz, C. Duker, M. Henneken, B. Rothe, K. Schaub, and I. Steudel. The Effect of Fluoranthene (Fla), Benzo(a)pyrene (BaP) and Cadmium (Cd) upon Survival Rate and Life Cycle Parameters of Two Terrestrial Annelids in Laboratory Test Systems. Newslett. Enchytraeidae4: 7-14.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	6500	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	1460	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	1830	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	1050	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	1150	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	1470	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Sulfuric acid, Cadmium salt (1:1)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Cadmium chloride (CdCl2)	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	49300000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Cadmium chloride (CdCl2)	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	55400000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Cadmium chloride (CdCl2)	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	69500000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Cadmium chloride (CdCl2)	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	58700000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Cadmium chloride (CdCl2)	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	60100000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Cadmium chloride (CdCl2)	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	63500000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Cadmium chloride (CdCl2)	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	49600000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Cadmium chloride (CdCl2)	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	50400000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Cadmium chloride (CdCl2)	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	59400000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	4000	NA	NR	ug/L	LAB	1994. Willuhn, J., H.P. Schmitt-Wrede, H. Greven, and F. Wunderlich. Cadmium-Induced mRNA Encoding a Nonmetallothionein 33-KDa Protein in Enchytraeus buchholzi (Oligochaeta). Ecotoxicol. Environ. Saf.29: 93-100.
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	4000	NR	NR	ug/L	LAB	1996. Willuhn, J., A. Otto, H. Koewius, and F. Wunderlich. Subtoxic Cadmium-Concentrations Reduce Copper-Toxicity in the Earthworm Enchytraeus buchholzi. Chemosphere32(11): 2205-2210.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Earthworm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	0.7	NR	NR	umol/L	LAB	1995. Achazi, R.K., G. Chroszcz, C. Duker, M. Henneken, B. Rothe, K. Schaub, and I. Steudel. The Effect of Fluoranthene (Fla), Benzo(a)pyrene (BaP) and Cadmium (Cd) upon Survival Rate and Life Cycle Parameters of Two Terrestrial Annelids in Laboratory Test Systems. Newslett. Enchytraeidae4: 7-14.
Cadmium chloride (CdCl2)	Earthworm	Worms	NR	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Cadmium chloride (CdCl2)	Eastern Pondhawk	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	0.893	NR	NR	mM	LAB	2009. Tollett, V.D., E.L. Benvenutti, L.A. Deer, and T.M. Rice. Differential Toxicity to Cd, Pb, and Cu in Dragonfly Larvae (Insecta: Odonata). Arch. Environ. Contam. Toxicol.56(1): 77-84.
Cadmium chloride (CdCl2)	European Physa	Molluscs	Fresh	Mortality	NR	Not Reported	T	250	NR	NR	ug/L	LAB	1985. Piccinni, E., O. Coppellotti, L. Giannoni, and O. Ravera. Effects of Cu, Cd, V in Physa acuta (Draparnaud). I: Partial Characterisation of Chelating Compounds. Environ. Technol. Lett.6(11): 505-513.
Cadmium chloride (CdCl2)	European Physa	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	250	NR	NR	ug/L	LAB	1985. Piccinni, E., O. Coppellotti, L. Giannoni, and O. Ravera. Effects of Cu, Cd, V in Physa acuta (Draparnaud). I: Partial Characterisation of Chelating Compounds. Environ. Technol. Lett.6(11): 505-513.
Cadmium chloride (CdCl2)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Cadmium chloride (CdCl2)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	510	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Cadmium chloride (CdCl2)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1995. Centeno, M.D.F., G. Persoone, and M.P. Goyvaerts. Cyst-Based Toxicity Tests. IX. The Potential of Thamnocephalus platyurus as Test Species in Comparison with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca). Environ. Toxicol. Water Qual.10(4): 275-282.
Sulfuric acid, Cadmium salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	390	NA	NR	ug/L	LAB	1994. Crisinel, A., L. Delaunay, D. Rossel, J. Tarradellas, H. Meyer, H. Saiah, P. Vogel, C. Delisle, and C. Blaise. Cyst-Based Ecotoxicological Tests Using Anostracans: Comparison of Two Species of Streptocephalus. Environ. Toxicol. Water Qual.9(4): 317-326.
Sulfuric acid, Cadmium salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1994. Crisinel, A., L. Delaunay, D. Rossel, J. Tarradellas, H. Meyer, H. Saiah, P. Vogel, C. Delisle, and C. Blaise. Cyst-Based Ecotoxicological Tests Using Anostracans: Comparison of Two Species of Streptocephalus. Environ. Toxicol. Water Qual.9(4): 317-326.
Nitric acid, Cadmium salt	Fairy Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1991. Mizutani, A., E. Ifune, A. Zanella, and C. Eriksen. Uptake of Lead, Cadmium and Zinc by the Fairy Shrimp, Branchinecta longiantenna (Crustacea; Anostraca). Hydrobiologia212: 145-149.
Nitric acid, Cadmium salt	Fairy Shrimp	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1991. Mizutani, A., E. Ifune, A. Zanella, and C. Eriksen. Uptake of Lead, Cadmium and Zinc by the Fairy Shrimp, Branchinecta longiantenna (Crustacea; Anostraca). Hydrobiologia212: 145-149.
Cadmium chloride (CdCl2)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2930	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Cadmium chloride (CdCl2)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2620	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Cadmium chloride (CdCl2)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2020	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Cadmium chloride (CdCl2)	Freshwater Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1820	NA	NR	ug/L	LAB	1997. Venugopal, N.B.R.K., T.V.D. Ramesh, D.S. Reddy, and S.L.N. Reddy. Effect of Cadmium on Antioxidant Enzyme Activities and Lipid Peroxidation in a Freshwater Field Crab, Barytelphusa guerini. Bull. Environ. Contam. Toxicol.59(1): 132-138.
Cadmium chloride (CdCl2)	Freshwater Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1820	NA	NR	ug/L	LAB	1993. Reddy, S.L.N., and N.B.R. Venugopal. Effect of Cadmium on Acetylcholinesterase Activity and Oxygen Consumption in a Freshwater Field Crab, Barytelphusa guerini. J. Environ. Biol.14(3): 203-210.
Cadmium chloride (CdCl2)	Freshwater Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1120*	NA	NR	ug/L	LAB	1989. Reddy, S.L.N., N.B.R. Venugopal, and J.V.R. Ramano Rao. In Vivo Effects of Cadmium Chloride on Certain Aspects of Carbohydrate Metabolism in the Tissues of a Freshwater Field Crab Barytelphusa guerini. Bull. Environ. Contam. Toxicol.42(6): 847-853.
Cadmium chloride (CdCl2)	Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	630.7	NA	NR	ug/L	LAB	1984. Ghate, H.V.. Gill Melanization and Heavy Metals in Freshwater Prawns. Indian J. Fish.31(3): 389-393.
Cadmium chloride (CdCl2)	Freshwater Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	51.82		NC	ug/L	LAB	2007. Pestana, J.L.T., A. Re, A.J.A. Nogueira, and A.M.V.M. Soares. Effects of Cadmium and Zinc on the Feeding Behaviour of Two Freshwater Crustaceans: Atyaephyra desmarestii (Decapoda) and Echinogammarus meridionalis (Amphipoda). Chemosphere68(8): 1556-1562.
Cadmium chloride (CdCl2)	Freshwater Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	59.2	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Cadmium chloride (CdCl2)	Freshwater Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	77.5	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Giant Floater Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1989. Malley, D.F., P.S.S. Chang, and R.H. Hesslein. Whole Lake Addition of Cadmium-109: Radiotracer Accumulation in the Mussel Population in the First Season. Sci. Total Environ.87-88: 397-417.
Cadmium chloride (CdCl2)	Giant Floater Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1989. Malley, D.F., P.S.S. Chang, and R.H. Hesslein. Whole Lake Addition of Cadmium-109: Radiotracer Accumulation in the Mussel Population in the First Season. Sci. Total Environ.87-88: 397-417.
Sulfuric acid, Cadmium salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Liao, I.C., and C.S. Hsieh. Toxicity of Three Heavy Metals to Macrobrachium rosenbergii. In: R.Hirano and I.Hanyu (Eds.), Proc.of the 2nd Asian Fisheries Forum, April 17-22, 1989, Tokyo, Japan, Asian Fisheries Society, Manila, Philippines: 923-926.
Sulfuric acid, Cadmium salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Liao, I.C., and C.S. Hsieh. Toxicity of Three Heavy Metals to Macrobrachium rosenbergii. In: R.Hirano and I.Hanyu (Eds.), Proc.of the 2nd Asian Fisheries Forum, April 17-22, 1989, Tokyo, Japan, Asian Fisheries Society, Manila, Philippines: 923-926.
Sulfuric acid, Cadmium salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	4	NA	NR	ug/L	LAB	1990. Liao, I.C., and C.S. Hsieh. Toxicity of Three Heavy Metals to Macrobrachium rosenbergii. In: R.Hirano and I.Hanyu (Eds.), Proc.of the 2nd Asian Fisheries Forum, April 17-22, 1989, Tokyo, Japan, Asian Fisheries Society, Manila, Philippines: 923-926.
Cadmium	Golden Stonefly, Willow Fly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects. Environ. Res.9(3): 285-289.
Cadmium	Golden Stonefly, Willow Fly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects. Environ. Res.9(3): 285-289.
Cadmium chloride (CdCl2)	Golden Stonefly, Willow Fly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	17500	NR	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Acute Cadmium Toxicity Studies upon Nine Species of Aquatic Insects. Environ. Res.9: 332-341.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Van Puymbroeck, S.L.C., W.J.J. Stips, and O.L.J. Vanderborght. The Antagonism between Selenium and Cadmium in a Freshwater Mollusc. Arch. Environ. Contam. Toxicol.11(1): 103-106.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Van Puymbroeck, S.L.C., W.J.J. Stips, and O.L.J. Vanderborght. The Antagonism between Selenium and Cadmium in a Freshwater Mollusc. Arch. Environ. Contam. Toxicol.11(1): 103-106.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3950	NA	NR	ug/L	LAB	1979. Chouikhi, A.. Choice and Set Up of the Food Chains in Freshwater in Order to Show the Bioaccumulation Character of a Pollutant. OECD-IRCHA Universite Paris-Sud, Unite d'Enseignement et de Recherche d'Hygiene et Protection de l'Homme et de son Environnement.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1650	NA	NR	ug/L	LAB	1979. Chouikhi, A.. Choice and Set Up of the Food Chains in Freshwater in Order to Show the Bioaccumulation Character of a Pollutant. OECD-IRCHA Universite Paris-Sud, Unite d'Enseignement et de Recherche d'Hygiene et Protection de l'Homme et de son Environnement.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1979. Chouikhi, A.. Choice and Set Up of the Food Chains in Freshwater in Order to Show the Bioaccumulation Character of a Pollutant. OECD-IRCHA Universite Paris-Sud, Unite d'Enseignement et de Recherche d'Hygiene et Protection de l'Homme et de son Environnement.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1979. Chouikhi, A.. Choice and Set Up of the Food Chains in Freshwater in Order to Show the Bioaccumulation Character of a Pollutant. OECD-IRCHA Universite Paris-Sud, Unite d'Enseignement et de Recherche d'Hygiene et Protection de l'Homme et de son Environnement.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Van Puymbroeck, S.L.C., W.J.J. Stips, and O.L.J. Vanderborght. The Antagonism between Selenium and Cadmium in a Freshwater Mollusc. Arch. Environ. Contam. Toxicol.11(1): 103-106.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Van Puymbroeck, S.L.C., W.J.J. Stips, and O.L.J. Vanderborght. The Antagonism between Selenium and Cadmium in a Freshwater Mollusc. Arch. Environ. Contam. Toxicol.11(1): 103-106.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Van Puymbroeck, S.L.C., W.J.J. Stips, and O.L.J. Vanderborght. The Antagonism between Selenium and Cadmium in a Freshwater Mollusc. Arch. Environ. Contam. Toxicol.11(1): 103-106.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Van Puymbroeck, S.L.C., W.J.J. Stips, and O.L.J. Vanderborght. The Antagonism between Selenium and Cadmium in a Freshwater Mollusc. Arch. Environ. Contam. Toxicol.11(1): 103-106.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Van Puymbroeck, S.L.C., W.J.J. Stips, and O.L.J. Vanderborght. The Antagonism between Selenium and Cadmium in a Freshwater Mollusc. Arch. Environ. Contam. Toxicol.11(1): 103-106.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Van Puymbroeck, S.L.C., W.J.J. Stips, and O.L.J. Vanderborght. The Antagonism between Selenium and Cadmium in a Freshwater Mollusc. Arch. Environ. Contam. Toxicol.11(1): 103-106.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Van Puymbroeck, S.L.C., W.J.J. Stips, and O.L.J. Vanderborght. The Antagonism between Selenium and Cadmium in a Freshwater Mollusc. Arch. Environ. Contam. Toxicol.11(1): 103-106.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Van Puymbroeck, S.L.C., W.J.J. Stips, and O.L.J. Vanderborght. The Antagonism between Selenium and Cadmium in a Freshwater Mollusc. Arch. Environ. Contam. Toxicol.11(1): 103-106.
Nitric acid, Cadmium salt	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Nitric acid, Cadmium salt	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1600	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Nitric acid, Cadmium salt	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3400	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Nitric acid, Cadmium salt	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	761*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Gomot, A.. Toxic Effects of Cadmium on Reproduction, Development, and Hatching in the Freshwater Snail Lymnaea stagnalis for Water Quality Monitoring. Ecotoxicol. Environ. Saf.41(3): 288-297.
Cadmium chloride (CdCl2)	Great Pond Snail	Molluscs	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Gomot, A.. Toxic Effects of Cadmium on Reproduction, Development, and Hatching in the Freshwater Snail Lymnaea stagnalis for Water Quality Monitoring. Ecotoxicol. Environ. Saf.41(3): 288-297.
Cadmium chloride (CdCl2)	Groundwater Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10700	NA	NR	ug/L	LAB	1992. Notenboom, J., K. Cruys, J. Hoekstra, and P. Van Beelen. Effect of Ambient Oxygen Concentration upon the Acute Toxicity of Chlorophenols and Heavy Metals to the Groundwater Copepod Parastenocaris germanica (Crustacea). Ecotoxicol. Environ. Saf.24(2): 131-143.
Cadmium chloride (CdCl2)	Groundwater Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14500	NA	NR	ug/L	LAB	1992. Notenboom, J., K. Cruys, J. Hoekstra, and P. Van Beelen. Effect of Ambient Oxygen Concentration upon the Acute Toxicity of Chlorophenols and Heavy Metals to the Groundwater Copepod Parastenocaris germanica (Crustacea). Ecotoxicol. Environ. Saf.24(2): 131-143.
Cadmium chloride (CdCl2)	Groundwater Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1992. Notenboom, J., K. Cruys, J. Hoekstra, and P. Van Beelen. Effect of Ambient Oxygen Concentration upon the Acute Toxicity of Chlorophenols and Heavy Metals to the Groundwater Copepod Parastenocaris germanica (Crustacea). Ecotoxicol. Environ. Saf.24(2): 131-143.
Cadmium chloride (CdCl2)	Groundwater Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1992. Notenboom, J., K. Cruys, J. Hoekstra, and P. Van Beelen. Effect of Ambient Oxygen Concentration upon the Acute Toxicity of Chlorophenols and Heavy Metals to the Groundwater Copepod Parastenocaris germanica (Crustacea). Ecotoxicol. Environ. Saf.24(2): 131-143.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	18		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	13		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	6		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	5		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	57		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	179		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	109		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	51		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	36		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Cadmium chloride (CdCl2)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	480		NC	ug/L	LAB	1982. Bengtsson, B.E., and B. Bergstrom. Toxicity Tests with Nitocra spinipes (Crustacea) and Some Metals Released from a Smelter Industry. In: K.Muller (Ed.), Coastal Research in the Gulf of Bothnia, Chapter 33, Dr.W.Junk Publ., The Hague, Netherlands:439-444 / Chem.Abstr.97: 439-444.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	430	NA	NR	ug/L	LAB	1987. Bengtsson, B.E., and B. Bergstrom. A Flowthrough Fecundity Test with Nitocra spinipes (Harpacticoidea Crustacea) for Aquatic Toxicity. Ecotoxicol. Environ. Saf.14: 260-268.
Cadmium chloride (CdCl2)	Harpacticoid Copepod	Crustaceans	Fresh	Reproduction	EC50		T	110	NA	NR	ug/L	LAB	1987. Bengtsson, B.E., and B. Bergstrom. A Flowthrough Fecundity Test with Nitocra spinipes (Harpacticoidea Crustacea) for Aquatic Toxicity. Ecotoxicol. Environ. Saf.14: 260-268.
Cadmium chloride (CdCl2)	Harpacticoid Copepod	Crustaceans	Fresh	Reproduction	EC50		T	37	NA	NR	ug/L	LAB	1987. Bengtsson, B.E., and B. Bergstrom. A Flowthrough Fecundity Test with Nitocra spinipes (Harpacticoidea Crustacea) for Aquatic Toxicity. Ecotoxicol. Environ. Saf.14: 260-268.
Cadmium chloride (CdCl2)	Harpacticoid Copepod	Crustaceans	Fresh	Reproduction	EC50		T	46	NA	NR	ug/L	LAB	1987. Bengtsson, B.E., and B. Bergstrom. A Flowthrough Fecundity Test with Nitocra spinipes (Harpacticoidea Crustacea) for Aquatic Toxicity. Ecotoxicol. Environ. Saf.14: 260-268.
Cadmium chloride (CdCl2)	Hydra	Invertebrates	Fresh	Growth	NR		T	12*	NA	NR	ug/L	LAB	1983. Santiago-Fandino, V.J.R.. The Effects of Nickel and Cadmium on the Growth Rate of Hydra littoralis and an Assessment of the Rate of Uptake of 63Ni and 14C by the Same Organism. Water Res.17(8): 917-923.
Cadmium chloride (CdCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	890	NA	NR	ug/L	LAB	1998. Beach, M.J., and D. Pascoe. The Role of Hydra vulgaris (Pallas) in Assessing the Toxicity of Freshwater Pollutants. Water Res.32(1): 101-106.
Cadmium chloride (CdCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2700	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Cadmium chloride (CdCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	450	NA	NR	ug/L	LAB	1998. Beach, M.J., and D. Pascoe. The Role of Hydra vulgaris (Pallas) in Assessing the Toxicity of Freshwater Pollutants. Water Res.32(1): 101-106.
Cadmium chloride (CdCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	840	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Cadmium chloride (CdCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	850	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Cadmium chloride (CdCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1998. Beach, M.J., and D. Pascoe. The Role of Hydra vulgaris (Pallas) in Assessing the Toxicity of Freshwater Pollutants. Water Res.32(1): 101-106.
Cadmium chloride (CdCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	450	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Cadmium chloride (CdCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1998. Beach, M.J., and D. Pascoe. The Role of Hydra vulgaris (Pallas) in Assessing the Toxicity of Freshwater Pollutants. Water Res.32(1): 101-106.
Cadmium chloride (CdCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	310	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Nitric acid, Cadmium salt	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3400	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Nitric acid, Cadmium salt	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	761*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Cadmium chloride (CdCl2)	Isopod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2060	NR	NR	ug/L	LAB	1981. Bosnak, A.D., and E.L. Morgan. Acute Toxicity of Cadmium, Zinc, and Total Residual Chlorine to Epigean and Hypogean Isopods (Asellidae). Natl. Speleological Soc. Bull.43: 12-18.
Cadmium chloride (CdCl2)	Isopod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2200	NR	NR	ug/L	LAB	1981. Bosnak, A.D., and E.L. Morgan. Acute Toxicity of Cadmium, Zinc, and Total Residual Chlorine to Epigean and Hypogean Isopods (Asellidae). Natl. Speleological Soc. Bull.43: 12-18.
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Wicklum, D., and R.W. Davies. The Effects of Chronic Cadmium Stress on Energy Acquisition and Allocation in a Freshwater Benthic Invertebrate Predator. Aquat. Toxicol.35(3-4): 237-252.
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Growth	NR	ultiple Tissue/Orga	T	NR	NR	NR	ug/L	LAB	1995. Davies, R.W., R.N. Singhal, and D.D. Wicklum. Changes in Reproductive Potential of the Leech Nephelopsis obscura (Erpobdellidae) as Biomarkers for Cadmium Stress. Can. J. Zool.73(12): 2192-2196.
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Mortality	EC50	Not Reported	T	832.6	NA	NR	ug/L	LAB	1997. Wicklum, D., D.E.C. Smith, and R.W. Davies. Mortality, Preference, Avoidance, and Activity of a Predatory Leech Exposed to Cadmium. Arch. Environ. Contam. Toxicol.32(2): 178-183.
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	3600	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	480	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	22.97	NA	NR	ug/L	LAB	1997. Wicklum, D., D.E.C. Smith, and R.W. Davies. Mortality, Preference, Avoidance, and Activity of a Predatory Leech Exposed to Cadmium. Arch. Environ. Contam. Toxicol.32(2): 178-183.
Nitric acid, Cadmium salt	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	1997*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Wicklum, D., and R.W. Davies. The Effects of Chronic Cadmium Stress on Energy Acquisition and Allocation in a Freshwater Benthic Invertebrate Predator. Aquat. Toxicol.35(3-4): 237-252.
Cadmium chloride (CdCl2)	Leech	Worms	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Davies, R.W., R.N. Singhal, and D.D. Wicklum. Changes in Reproductive Potential of the Leech Nephelopsis obscura (Erpobdellidae) as Biomarkers for Cadmium Stress. Can. J. Zool.73(12): 2192-2196.
Cadmium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium chloride (CdCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Long-Horn Caddisfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1992. Timmermans, K.R., E. Spijkerman, M. Tonkes, and H. Govers. Cadmium and Zinc Uptake by Two Species of Aquatic Invertebrate Predators from Dietary and Aqueous Sources. Can. J. Fish. Aquat. Sci.49(4): 655-662.
Cadmium	Mangrove Oyster	Molluscs	Fresh	Mortality	LC50	Not Reported	T	45000	NA	NR	ug/L	LAB	1978. Chung, K.S.. Acute Toxicity of Cadmium and Copper in the Mangrove Oyster (La Aguda Toxididad de Cadmio y Cobre en la Ostra de Mangre (Crassostrea rhizophrae)). Acta Cient. Venez.29(2): 14.
Cadmium	Mangrove Oyster	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1978. Chung, K.S.. Acute Toxicity of Cadmium and Copper in the Mangrove Oyster (La Aguda Toxididad de Cadmio y Cobre en la Ostra de Mangre (Crassostrea rhizophrae)). Acta Cient. Venez.29(2): 14.
Cadmium	Mangrove Oyster	Molluscs	Fresh	Mortality	LC50	Not Reported	T	900	NA	NR	ug/L	LAB	1978. Chung, K.S.. Acute Toxicity of Cadmium and Copper in the Mangrove Oyster (La Aguda Toxididad de Cadmio y Cobre en la Ostra de Mangre (Crassostrea rhizophrae)). Acta Cient. Venez.29(2): 14.
Cadmium	Mayfly	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	650000	NA	NR	ug/L	LAB	1986. Hatakeyama, S.. Effects of Heavy Metals Cadmium, Copper, and Zinc on Some Aquatic Organisms Through the Food Chain. C. A. Sel. -Environ. Pollut.22: 105.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	90000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	95000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	54000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	61000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	18000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	19000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6200	NA	NR	ug/L	LAB	1980. Leonhard, S.L., S.G. Lawrence, M.K. Friesen, and J.F. Flannagan. Evaluation of the Acute Toxicity of the Heavy Metal Cadmium to Nymphs of the Burrowing Mayfly, Hexagenia rigida. In: J.F.Flannagan and K.E.Marshall (Eds.), Advances in Ephemeroptera Biology, Plenum Publ.Corp.: 157-465.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1060	NA	NR	ug/L	LAB	1995. Gerhardt, A.. Joint and Single Toxicity of Cd and Fe Related to Metal Uptake in the Mayfly Leptophlebia marginata (L.) (Insecta). Hydrobiologia306(3): 229-240.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1995. Gerhardt, A.. Joint and Single Toxicity of Cd and Fe Related to Metal Uptake in the Mayfly Leptophlebia marginata (L.) (Insecta). Hydrobiologia306(3): 229-240.
Cadmium chloride (CdCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	28000	NR	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Acute Cadmium Toxicity Studies upon Nine Species of Aquatic Insects. Environ. Res.9: 332-341.
Cadmium chloride (CdCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	449	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	840	NA	NR	ug/L	LAB	1974. Thorp, V.J., and P.S. Lake. Toxicity Bioassays of Cadmium on Selected Freshwater Invertebrates and the Interaction of Cadmium and Zinc on the Freshwater Shrimp, Paratya. Aust. J. Mar. Freshw. Res.25(1): 97-104.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1992. Gerhardt, A.. Acute Toxicity of Cd in Stream Invertebrates in Relation to pH and Test Design. Hydrobiologia239(2): 93-100.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1992. Gerhardt, A.. Acute Toxicity of Cd in Stream Invertebrates in Relation to pH and Test Design. Hydrobiologia239(2): 93-100.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1992. Gerhardt, A.. Acute Toxicity of Cd in Stream Invertebrates in Relation to pH and Test Design. Hydrobiologia239(2): 93-100.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1992. Gerhardt, A.. Acute Toxicity of Cd in Stream Invertebrates in Relation to pH and Test Design. Hydrobiologia239(2): 93-100.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	136455	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	15267	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	378550	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	52950	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	28580	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6988	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	70556	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	926.3	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3600	NA	NR	ug/L	LAB	1992. Gerhardt, A.. Acute Toxicity of Cd in Stream Invertebrates in Relation to pH and Test Design. Hydrobiologia239(2): 93-100.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4400	NA	NR	ug/L	LAB	1992. Gerhardt, A.. Acute Toxicity of Cd in Stream Invertebrates in Relation to pH and Test Design. Hydrobiologia239(2): 93-100.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	10500		NC	ug/L	LAB	2008. Brinkman, S.F., and W.D. Johnston. Acute Toxicity of Aqueous Copper, Cadmium, and Zinc to the Mayfly Rhithrogena hageni. Arch. Environ. Contam. Toxicol.54(3): 466-472.
Nitric acid, Cadmium salt	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	26626*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	136455	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	15267	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	378550	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	52950	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	28580	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	6988	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	70556	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	926.3	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	2000	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD0	Not Reported	T	10000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD0	Not Reported	T	0.5	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD100	Not Reported	T	1000000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD100	Not Reported	T	5000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	136455	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	15267	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	378550	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	52950	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	28580	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	6988	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	70556	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	926.3	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LOEL	Not Reported	T	3520		NC	ug/L	LAB	2008. Brinkman, S.F., and W.D. Johnston. Acute Toxicity of Aqueous Copper, Cadmium, and Zinc to the Mayfly Rhithrogena hageni. Arch. Environ. Contam. Toxicol.54(3): 466-472.
Sulfuric acid, Cadmium salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	NOEL	Not Reported	T	1880		NC	ug/L	LAB	2008. Brinkman, S.F., and W.D. Johnston. Acute Toxicity of Aqueous Copper, Cadmium, and Zinc to the Mayfly Rhithrogena hageni. Arch. Environ. Contam. Toxicol.54(3): 466-472.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects. Environ. Res.9(3): 285-289.
Cadmium	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Synergism Between Dissolved Oxygen and Cadmium Toxicity in Five Species of Aquatic Insects. Environ. Res.9(3): 285-289.
Cadmium chloride (CdCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	42500	NR	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Acute Cadmium Toxicity Studies upon Nine Species of Aquatic Insects. Environ. Res.9: 332-341.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	EC20	Whole Organism	T	8.1	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	EC20	Whole Organism	T	6.7	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	EC50	Not Reported	T	145	NR	NR	nM	LAB	2002. Groenendijk, D., S.M.G. Lucker, M. Plans, M.H.S. Kraak, and W. Admiraal. Dynamics of Metal Adaptation in Riverine Chironomids. Environ. Pollut.117(1): 101-109.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	EC50	Not Reported	T	151	NR	NR	nM	LAB	2002. Groenendijk, D., S.M.G. Lucker, M. Plans, M.H.S. Kraak, and W. Admiraal. Dynamics of Metal Adaptation in Riverine Chironomids. Environ. Pollut.117(1): 101-109.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	EC50	Not Reported	T	200	NR	NR	nM	LAB	2002. Groenendijk, D., S.M.G. Lucker, M. Plans, M.H.S. Kraak, and W. Admiraal. Dynamics of Metal Adaptation in Riverine Chironomids. Environ. Pollut.117(1): 101-109.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	EC50	Not Reported	T	247	NR	NR	nM	LAB	2002. Groenendijk, D., S.M.G. Lucker, M. Plans, M.H.S. Kraak, and W. Admiraal. Dynamics of Metal Adaptation in Riverine Chironomids. Environ. Pollut.117(1): 101-109.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	EC50	Not Reported	T	250	NR	NR	nM	LAB	2002. Groenendijk, D., S.M.G. Lucker, M. Plans, M.H.S. Kraak, and W. Admiraal. Dynamics of Metal Adaptation in Riverine Chironomids. Environ. Pollut.117(1): 101-109.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	EC50	Not Reported	T	254	NR	NR	nM	LAB	2002. Groenendijk, D., S.M.G. Lucker, M. Plans, M.H.S. Kraak, and W. Admiraal. Dynamics of Metal Adaptation in Riverine Chironomids. Environ. Pollut.117(1): 101-109.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	EC50	Not Reported	T	258	NR	NR	nM	LAB	2002. Groenendijk, D., S.M.G. Lucker, M. Plans, M.H.S. Kraak, and W. Admiraal. Dynamics of Metal Adaptation in Riverine Chironomids. Environ. Pollut.117(1): 101-109.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	EC50	Not Reported	T	271	NR	NR	nM	LAB	2002. Groenendijk, D., S.M.G. Lucker, M. Plans, M.H.S. Kraak, and W. Admiraal. Dynamics of Metal Adaptation in Riverine Chironomids. Environ. Pollut.117(1): 101-109.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	LOEC	Whole Organism	T	10.2	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	LOEC	Whole Organism	T	10.2	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	LOEC	Not Reported	T	500	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	LOEC	Not Reported	T	100	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	LOEC	Not Reported	T	500	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	MATC	Not Reported	T	6.6	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	MATC	Whole Organism	T	6.6	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NOEC	Whole Organism	T	4.3	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NOEC	Whole Organism	T	10.2	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NOEC	Whole Organism	T	4.3	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NOEC	Whole Organism	F	20000	NR	NR	ug/L	LAB	2006. Lee, S.M., S.B. Lee, C.H. Park, and J. Choi. Expression of Heat Shock Protein and Hemoglobin Genes in Chironomus tentans (Diptera, Chironomidae) Larvae Exposed to Various Environmental Pollutants: A Potential Biomarker of Freshwater Monitoring. Chemosphere65(6): 1074-1081.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NOEC	Whole Organism	F	20000	NR	NR	ug/L	LAB	2006. Lee, S.M., S.B. Lee, C.H. Park, and J. Choi. Expression of Heat Shock Protein and Hemoglobin Genes in Chironomus tentans (Diptera, Chironomidae) Larvae Exposed to Various Environmental Pollutants: A Potential Biomarker of Freshwater Monitoring. Chemosphere65(6): 1074-1081.
Cadmium	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	61	NA	NR	ug/L	LAB	1992. Timmermans, K.R., W. Peeters, and M. Tonkes. Cadmium, Zinc, Lead and Copper in Chironomus riparius (Meigen) Larvae (Diptera, Chironomidae): Uptake and Effects. Hydrobiologia241(2): 119-134.
Cadmium	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	150	NA	NR	ug/L	LAB	1989. Pascoe, D., K.A. Williams, and D.W.J. Green. Chronic Toxicity of Cadmium to Chironomus riparius Meigen - Effects upon Larval Development and Adult Emergence. Hydrobiologia175(2): 109-115.
Cadmium	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	2200000	NA	NR	ug/L	LAB	1986. Hatakeyama, S.. Effects of Heavy Metals Cadmium, Copper, and Zinc on Some Aquatic Organisms Through the Food Chain. C. A. Sel. -Environ. Pollut.22: 105.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	nM	LAB	1999. Groenendijk, D., B. Van Opzeeland, L.M. Dionisio Pires, and J.F. Postma. Fluctuating Life-History Parameters Indicating Temporal Variability in Metal Adaptation in Riverine Chironomids. Arch. Environ. Contam. Toxicol.37(2): 175-181.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	nM	LAB	1999. Groenendijk, D., B. Van Opzeeland, L.M. Dionisio Pires, and J.F. Postma. Fluctuating Life-History Parameters Indicating Temporal Variability in Metal Adaptation in Riverine Chironomids. Arch. Environ. Contam. Toxicol.37(2): 175-181.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	nM	LAB	1996. Postma, J.F., P. Van Nugteren, and M.B. Buckert-De Jong. Increased Cadmium Excretion in Metal-Adapted Populations of the Midge Chironomus riparius (Diptera). Environ. Toxicol. Chem.15(3): 332-339.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	nM	LAB	1995. Postma, J.F., and C. Davids. Tolerance Induction and Life Cycle Changes in Cadmium-Exposed Chironomus riparius (Diptera) During Consecutive Generations. Ecotoxicol. Environ. Saf.30(2): 195-202.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	nM	LAB	1995. Postma, J.F., M. Kyed, and W. Admiraal. Site Specific Differentiation in Metal Tolerance in the Midge Chironomus riparius (Diptera, Chironomidae). Hydrobiologia315(2): 159-165.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Postma, J.F., M.C. Buckert-De Jong, N. Staats, and C. Davids. Chronic Toxicity of Cadmium to Chironomus riparius (Diptera: Chironomidae) at Different Food Levels. Arch. Environ. Contam. Toxicol.26(2): 143-148.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	T	43	NR	NR	ug/L	LAB	1999. Stuijfzand, S.C., M.J. Jonker, E. Van Ammelrooy, and W. Admiraal. Species-Specific Responses to Metals in Organically Enriched River Water, with Emphasis on Effects of Humic Acids. Environ. Pollut.106(1): 115-121.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Sildanchandra, W., and M. Crane. Influence of Sexual Dimorphism in Chironomus riparius Meigen on Toxic Effects of Cadmium. Environ. Toxicol. Chem.19(9): 2309-2313.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Sildanchandra, W., and M. Crane. Influence of Sexual Dimorphism in Chironomus riparius Meigen on Toxic Effects of Cadmium. Environ. Toxicol. Chem.19(9): 2309-2313.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Sildanchandra, W., and M. Crane. Influence of Sexual Dimorphism in Chironomus riparius Meigen on Toxic Effects of Cadmium. Environ. Toxicol. Chem.19(9): 2309-2313.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2008. Ha, M.H., and J. Choi. Chemical-Induced Alteration of Hemoglobin Expression in the 4th Instar Larvae of Chironomus tentans Mg. (Diptera: Chironomidae). Environ. Toxicol. Pharmacol.25(3): 393-398.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC10	Not Reported	T	93050	NR	NR	ug/L	LAB	2008. Ha, M.H., and J. Choi. Chemical-Induced Alteration of Hemoglobin Expression in the 4th Instar Larvae of Chironomus tentans Mg. (Diptera: Chironomidae). Environ. Toxicol. Pharmacol.25(3): 393-398.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC100	Not Reported	T	12000*	NA	NR	ug/L	LAB	1979. Rathore, H.S., P.K. Sanghvi, and H. Swarup. Toxicity of Cadmium Chloride and Lead Nitrate to Chironomus tentans Larvae. Environ. Pollut.18(3): 173-177.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC20	Not Reported	T	0.7	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC20	Not Reported	T	4.6	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC20	Not Reported	T	3.3	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	21530	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	53610	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	15210	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	7690	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	200000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	4320	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	6680	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	7360	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	440	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	9990	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	210	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	2370	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	2700	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	130	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1930	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	730	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1410	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	480	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	80	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1060	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1060	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1690	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1690	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1690	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	670	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	890	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	890	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1350	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	325000	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5100	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2000000	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	260000	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500000	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2050000	NA	NR	ug/L	LAB	1990. Pascoe, D., A.F. Brown, B.M.J. Evans, and C. McKavanagh. Effects and Fate of Cadmium During Toxicity Tests with Chironomus riparius - the Influence of Food and Artificial Sediment. Arch. Environ. Contam. Toxicol.19(6): 872-877.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2050000	NA	NR	ug/L	LAB	1990. Pascoe, D., A.F. Brown, B.M.J. Evans, and C. McKavanagh. Effects and Fate of Cadmium During Toxicity Tests with Chironomus riparius - the Influence of Food and Artificial Sediment. Arch. Environ. Contam. Toxicol.19(6): 872-877.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5.4	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	45000	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	72000	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	725000	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	555000	NA	NR	ug/L	LAB	1990. Pascoe, D., A.F. Brown, B.M.J. Evans, and C. McKavanagh. Effects and Fate of Cadmium During Toxicity Tests with Chironomus riparius - the Influence of Food and Artificial Sediment. Arch. Environ. Contam. Toxicol.19(6): 872-877.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	670000	NA	NR	ug/L	LAB	1990. Pascoe, D., A.F. Brown, B.M.J. Evans, and C. McKavanagh. Effects and Fate of Cadmium During Toxicity Tests with Chironomus riparius - the Influence of Food and Artificial Sediment. Arch. Environ. Contam. Toxicol.19(6): 872-877.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7900	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7.2	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	54000	NA	NR	ug/L	LAB	1986. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. The Acute Toxicity of Cadmium to Different Larval Stages of Chironomus riparius (Diptera: Chironomidae) and its Ecological Significance for Pollution Regulation. Oceanologia (Wroc.)70(3): 362-366.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	140000	NA	NR	ug/L	LAB	1990. Pascoe, D., A.F. Brown, B.M.J. Evans, and C. McKavanagh. Effects and Fate of Cadmium During Toxicity Tests with Chironomus riparius - the Influence of Food and Artificial Sediment. Arch. Environ. Contam. Toxicol.19(6): 872-877.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	84000	NA	NR	ug/L	LAB	1990. Pascoe, D., A.F. Brown, B.M.J. Evans, and C. McKavanagh. Effects and Fate of Cadmium During Toxicity Tests with Chironomus riparius - the Influence of Food and Artificial Sediment. Arch. Environ. Contam. Toxicol.19(6): 872-877.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	11.7	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	220000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	170000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	255200	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	169500	NR	NR	ug/L	LAB	2008. Ha, M.H., and J. Choi. Chemical-Induced Alteration of Hemoglobin Expression in the 4th Instar Larvae of Chironomus tentans Mg. (Diptera: Chironomidae). Environ. Toxicol. Pharmacol.25(3): 393-398.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	963	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	635	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	29560	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3.8	NA	NR	ug/L	LAB	1980. Anderson, R.L., C.T. Walbridge, and J.T. Fiandt. Survival and Growth of Tanytarsus dissimilis (Chironomidae) Exposed to Copper, Cadmium, Zinc, and Lead. Arch. Environ. Contam. Toxicol.9(3): 329-335.
Nitric acid, Cadmium salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	D	9380	NR	NR	ug/L	LAB	2008. Bechard, K.M., P.L. Gillis, and C.M. Wood. Acute Toxicity of Waterborne Cd, Cu, Pb, Ni, and Zn to First-Instar Chironomus riparius Larvae. Arch. Environ. Contam. Toxicol.54(3): 454-459.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	NR	Mortality	LC50	Not Reported	T	15338*	NA	NR	ug/L	LAB	1981. Rao, D.S., and A.B. Saxena. Acute Toxicity of Mercury, Zinc, Lead, Cadmium, Manganese to the Chironomus sp. Int. J. Environ. Stud.16(3-4): 225-226.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	5100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	1200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC90	Not Reported	T	308800	NR	NR	ug/L	LAB	2008. Ha, M.H., and J. Choi. Chemical-Induced Alteration of Hemoglobin Expression in the 4th Instar Larvae of Chironomus tentans Mg. (Diptera: Chironomidae). Environ. Toxicol. Pharmacol.25(3): 393-398.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	10.2	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	4.3	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	500	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	1000	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	1000	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	MATC	Not Reported	T	6.6	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	4.3	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	1.8	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	500	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	500	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	500	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Timmermans, K.R., and P.A. Walker. The Fate of Trace Metals During the Metamorphosis of Chironomids (Diptera, Chironomidae). Environ. Pollut.62(1): 73-85.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	150	NA	NR	ug/L	LAB	1989. Pascoe, D., K.A. Williams, and D.W.J. Green. Chronic Toxicity of Cadmium to Chironomus riparius Meigen - Effects upon Larval Development and Adult Emergence. Hydrobiologia175(2): 109-115.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Timmermans, K.R., and P.A. Walker. The Fate of Trace Metals During the Metamorphosis of Chironomids (Diptera, Chironomidae). Environ. Pollut.62(1): 73-85.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Postma, J.F., and C. Davids. Tolerance Induction and Life Cycle Changes in Cadmium-Exposed Chironomus riparius (Diptera) During Consecutive Generations. Ecotoxicol. Environ. Saf.30(2): 195-202.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Postma, J.F., and C. Davids. Tolerance Induction and Life Cycle Changes in Cadmium-Exposed Chironomus riparius (Diptera) During Consecutive Generations. Ecotoxicol. Environ. Saf.30(2): 195-202.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	nM	LAB	1996. Postma, J.F., P. Van Nugteren, and M.B. Buckert-De Jong. Increased Cadmium Excretion in Metal-Adapted Populations of the Midge Chironomus riparius (Diptera). Environ. Toxicol. Chem.15(3): 332-339.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	nM	LAB	1995. Postma, J.F., M. Kyed, and W. Admiraal. Site Specific Differentiation in Metal Tolerance in the Midge Chironomus riparius (Diptera, Chironomidae). Hydrobiologia315(2): 159-165.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	16.2	NA	NR	ug/L	LAB	1994. Postma, J.F., M.C. Buckert-De Jong, N. Staats, and C. Davids. Chronic Toxicity of Cadmium to Chironomus riparius (Diptera: Chironomidae) at Different Food Levels. Arch. Environ. Contam. Toxicol.26(2): 143-148.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Postma, J.F., M.C. Buckert-De Jong, N. Staats, and C. Davids. Chronic Toxicity of Cadmium to Chironomus riparius (Diptera: Chironomidae) at Different Food Levels. Arch. Environ. Contam. Toxicol.26(2): 143-148.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sildanchandra, W., and M. Crane. Influence of Sexual Dimorphism in Chironomus riparius Meigen on Toxic Effects of Cadmium. Environ. Toxicol. Chem.19(9): 2309-2313.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	300000	NA	NR	ug/L	LAB	1987. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. Effect of Cadmium on Oviposition and Egg Viability in Chironomus riparius (Diptera: Chironomidae). Bull. Environ. Contam. Toxicol.38(1): 86-90.
Cadmium	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	150000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1983. Seidman, L.A.. Bioaccumulation and Toxicity of Cadmium in Aquatic Invertebrates. Ph.D.Thesis, University of Wisconsin, Milwaukee, WI: 118.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	30.4	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	2.5	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	2	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Nitric acid, Cadmium salt	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Wentsel, R.S.. Distributional and Sublethal Effects of Heavy Metals on Benthic Macroinvertebrates. Ph.D.Thesis, Purdue University, West Lafayette, IN: 108 p..
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	43	NR	NR	ug/L	LAB	1999. Stuijfzand, S.C., M.J. Jonker, E. Van Ammelrooy, and W. Admiraal. Species-Specific Responses to Metals in Organically Enriched River Water, with Emphasis on Effects of Humic Acids. Environ. Pollut.106(1): 115-121.
Cadmium	Midge	Insects/Spiders	Fresh	Reproduction	NR	Not Reported	T	650000	NA	NR	ug/L	LAB	1986. Hatakeyama, S.. Effects of Heavy Metals Cadmium, Copper, and Zinc on Some Aquatic Organisms Through the Food Chain. C. A. Sel. -Environ. Pollut.22: 105.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Postma, J.F., and C. Davids. Tolerance Induction and Life Cycle Changes in Cadmium-Exposed Chironomus riparius (Diptera) During Consecutive Generations. Ecotoxicol. Environ. Saf.30(2): 195-202.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Postma, J.F., M.C. Buckert-De Jong, N. Staats, and C. Davids. Chronic Toxicity of Cadmium to Chironomus riparius (Diptera: Chironomidae) at Different Food Levels. Arch. Environ. Contam. Toxicol.26(2): 143-148.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Reproduction	NR		T	100000	NA	NR	ug/L	LAB	1987. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. Effect of Cadmium on Oviposition and Egg Viability in Chironomus riparius (Diptera: Chironomidae). Bull. Environ. Contam. Toxicol.38(1): 86-90.
Cadmium chloride (CdCl2)	Midge	Insects/Spiders	Fresh	Reproduction	NR		T	30000	NA	NR	ug/L	LAB	1987. Williams, K.A., D.W.J. Green, D. Pascoe, and D.E. Gower. Effect of Cadmium on Oviposition and Egg Viability in Chironomus riparius (Diptera: Chironomidae). Bull. Environ. Contam. Toxicol.38(1): 86-90.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Midge Family	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1979. Giesy, J.P.,Jr., H.J. Kania, J.W. Bowling, R.L. Knight, S. Mashburn, and S. Clarkin. Fate and Biological Effects of Cadmium Introduced into Channel Microcosms. EPA-600/3-79-039, Savannah River Ecol.Lab., Inst.of Ecol., Univ.of Georgia, Aiken, SC: 157 p..
Sulfuric acid, Cadmium salt (1:1)	Mite And Tick Suborder	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	2925000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mite And Tick Suborder	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	1444700	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Mite And Tick Suborder	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	1725000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Cadmium chloride (CdCl2)	Mollusk	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1996. Lam, P.K.S.. Effects of Cadmium on the Consumption and Absorption Rates of a Tropical Freshwater Snail, Radix plicatulus. Chemosphere32(11): 2127-2132.
Cadmium	Mussel	Molluscs	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1991. Raj, A.I.M., and P.S. Hameed. Effect of Copper, Cadmium and Mercury on Metabolism of the Freshwater Mussel Lamellidens marginalis (Lamarck). J. Environ. Biol.12(2): 131-135.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDN	1999. Stewart, A.R.. Accumulation of Cd by a Freshwater Mussel (Pyganodon grandis) is Reduced in the Presence of Cu, Zn, Pb, and Ni. Can. J. Fish. Aquat. Sci.56(3): 467-478.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	7732.1	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	6901.2	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	5103.2	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	4387.1	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Cadmium	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1989. Hameed, P.S., and A.I.M. Raj. Effects of Copper, Cadmium and Mercury on Crystalline Style of the Freshwater Mussel Lamellidens marginalis (Lamarck). Indian J. Environ. Health31(2): 131-136.
Cadmium	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1991. Raj, A.I.M., and P.S. Hameed. Effect of Copper, Cadmium and Mercury on Metabolism of the Freshwater Mussel Lamellidens marginalis (Lamarck). J. Environ. Biol.12(2): 131-135.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	137	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	57	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	107	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	9	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	16645.6	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	10765.3	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7691.4	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7202.4	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Cadmium chloride (CdCl2)	Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1999. Kaspler, P.. Effect of Cadmium and Zinc Salts on Energy Metabolism and Survival of Unio tumidus Philipsson. J. Basic Clin. Physiol. Pharmacol.10(1): 57-72.
Sulfuric acid, Cadmium salt (1:1)	Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1999. Kaspler, P.. Effect of Cadmium and Zinc Salts on Energy Metabolism and Survival of Unio tumidus Philipsson. J. Basic Clin. Physiol. Pharmacol.10(1): 57-72.
Sulfuric acid, Cadmium salt (1:1)	Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	300		NC	ug/L	LAB	2007. Loayza-Muro, R., and R. Elias-Letts. Responses of the Mussel Anodontites trapesialis (Unionidae) to Environmental Stressors: Effect of pH, Temperature and Metals on Filtration Rate. Environ. Pollut.149(2): 209-215.
Cadmium chloride (CdCl2)	Mussel, Eastern Elliptio	Molluscs	Fresh	Growth	NOEC	Not Reported	T	49.5	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.
Cadmium chloride (CdCl2)	Mussel, Eastern Elliptio	Molluscs	Fresh	Growth	NOEC	Not Reported	T	49.5	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.
Cadmium chloride (CdCl2)	Mussel, Eastern Elliptio	Molluscs	Fresh	Growth	NOEC	Not Reported	T	49.5	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Mussel, Eastern Elliptio	Molluscs	Fresh	Growth	NOEC	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.
Cadmium chloride (CdCl2)	Mussel, Eastern Elliptio	Molluscs	Fresh	Growth	NOEC	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.
Cadmium chloride (CdCl2)	Mussel, Eastern Elliptio	Molluscs	Fresh	Growth	NOEC	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.
Cadmium chloride (CdCl2)	Mussel, Eastern Elliptio	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Tessier, L., G. Vaillancourt, and L. Pazdernik. Laboratory Study of Cd and Hg Uptake by Two Freshwater Molluscs in Relation to Concentration, Age and Exposure Time. Water Air Soil Pollut.86(1-4): 347-357.
Cadmium chloride (CdCl2)	Mussel, Eastern Elliptio	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Tessier, L., G. Vaillancourt, and L. Pazdernik. Laboratory Study of Cd and Hg Uptake by Two Freshwater Molluscs in Relation to Concentration, Age and Exposure Time. Water Air Soil Pollut.86(1-4): 347-357.
Cadmium chloride (CdCl2)	Naidid	Worms	Fresh	Mortality	LC50	Not Reported	T	214.6	NR	NR	ug/L	LAB	1991. Smith, D.P., J.H. Kennedy, and K.L. Dickson. An Evaluation of a Naidid Oligochaete as a Toxicity Test Organism. Environ. Toxicol. Chem.10(11): 1459-1465.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	uM	LAB	1989. Van Kessel, W.H.M., R.W. Brocades Zaalberg, and W. Seinen. Testing Environmental Pollutants on Soil Organisms: A Simple Assay to Investigate the Toxicity of Environmental Pollutants on Soil Organisms, Using CdCl2 and Nematodes. Ecotoxicol. Environ. Saf.18: 181-190.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	885.2	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	838.6	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	527.4	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	214.9	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	131.1	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1222000	NR	NR	ug/L	LAB	1997. Cressman III, C.P., and P.L. Williams. Reference Toxicants for Toxicity Testing Using Caenorhabditis elegans in Aquatic Media. In: F.J.Dwyer, T.R.Doane, and M.L.Hinman (Eds.), Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment, 6th Volume, ASTM STP 1317, Philadelphia, PA: 518-532.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	21000	NR	NR	ug/L	LAB	1997. Cressman III, C.P., and P.L. Williams. Reference Toxicants for Toxicity Testing Using Caenorhabditis elegans in Aquatic Media. In: F.J.Dwyer, T.R.Doane, and M.L.Hinman (Eds.), Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment, 6th Volume, ASTM STP 1317, Philadelphia, PA: 518-532.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	25000	NR	NR	ug/L	LAB	1997. Cressman III, C.P., and P.L. Williams. Reference Toxicants for Toxicity Testing Using Caenorhabditis elegans in Aquatic Media. In: F.J.Dwyer, T.R.Doane, and M.L.Hinman (Eds.), Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment, 6th Volume, ASTM STP 1317, Philadelphia, PA: 518-532.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	4000	NR	NR	ug/L	LAB	1997. Cressman III, C.P., and P.L. Williams. Reference Toxicants for Toxicity Testing Using Caenorhabditis elegans in Aquatic Media. In: F.J.Dwyer, T.R.Doane, and M.L.Hinman (Eds.), Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment, 6th Volume, ASTM STP 1317, Philadelphia, PA: 518-532.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	7000	NR	NR	ug/L	LAB	1997. Cressman III, C.P., and P.L. Williams. Reference Toxicants for Toxicity Testing Using Caenorhabditis elegans in Aquatic Media. In: F.J.Dwyer, T.R.Doane, and M.L.Hinman (Eds.), Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment, 6th Volume, ASTM STP 1317, Philadelphia, PA: 518-532.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	943000	NR	NR	ug/L	LAB	1997. Cressman III, C.P., and P.L. Williams. Reference Toxicants for Toxicity Testing Using Caenorhabditis elegans in Aquatic Media. In: F.J.Dwyer, T.R.Doane, and M.L.Hinman (Eds.), Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment, 6th Volume, ASTM STP 1317, Philadelphia, PA: 518-532.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	8.39	L	1.69	mmol/L	LAB	1997. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Predicting Relative Metal Toxicity with Ion Characteristics: Caenorhabditis elegans LC50. Aquat. Toxicol.39(3-4): 279-290.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	185	NR	NR	uM	LAB	1994. Stringham, E.G., and E.P.M. Candido. Transgenic hsp16-lacZ Strains of the Soil Nematode Caenorhabditis elegans as Biological Monitors of Environmental Stress. Environ. Toxicol. Chem.13(8): 1211-1220.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	262	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Donkin, S.G., and P.L. Williams. Influence of Developmental Stage, Salts and Food Presence on Various End Points Using Caenorhabditis elegans for Aquatic Toxicity Testing. Environ. Toxicol. Chem.14(12): 2139-2147.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Donkin, S.G., and P.L. Williams. Influence of Developmental Stage, Salts and Food Presence on Various End Points Using Caenorhabditis elegans for Aquatic Toxicity Testing. Environ. Toxicol. Chem.14(12): 2139-2147.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	904000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	12000	NR	NR	ug/L	LAB	1997. Cressman III, C.P., and P.L. Williams. Reference Toxicants for Toxicity Testing Using Caenorhabditis elegans in Aquatic Media. In: F.J.Dwyer, T.R.Doane, and M.L.Hinman (Eds.), Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment, 6th Volume, ASTM STP 1317, Philadelphia, PA: 518-532.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2000	NR	NR	ug/L	LAB	1997. Cressman III, C.P., and P.L. Williams. Reference Toxicants for Toxicity Testing Using Caenorhabditis elegans in Aquatic Media. In: F.J.Dwyer, T.R.Doane, and M.L.Hinman (Eds.), Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment, 6th Volume, ASTM STP 1317, Philadelphia, PA: 518-532.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2000	NR	NR	ug/L	LAB	1997. Cressman III, C.P., and P.L. Williams. Reference Toxicants for Toxicity Testing Using Caenorhabditis elegans in Aquatic Media. In: F.J.Dwyer, T.R.Doane, and M.L.Hinman (Eds.), Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment, 6th Volume, ASTM STP 1317, Philadelphia, PA: 518-532.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	125	NR	NR	uM	LAB	1994. Stringham, E.G., and E.P.M. Candido. Transgenic hsp16-lacZ Strains of the Soil Nematode Caenorhabditis elegans as Biological Monitors of Environmental Stress. Environ. Toxicol. Chem.13(8): 1211-1220.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	134.6	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	130.9	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	174.6	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	105.9	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	82.9	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	37.3	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	29.4	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	29.4	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	336	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	154.1	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	91.8	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	398	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	132.8	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	107	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	216	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	270.2	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	170.4	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	125.3	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	204	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	177.1	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	120.2	NA	NR	umol/L	LAB	1994. Kammenga, J.E., C.A.M. Van Gestel, and J. Bakker. Patterns of Sensitivity to Cadmium and Pentachlorophenol Among Nematode Species from Different Taxonomic and Ecological Groups. Arch. Environ. Contam. Toxicol.27(1): 88-94.
Nitric acid, Cadmium salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	11.63	L	2.56	mM	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	NOEC	Not Reported	T	150000	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Jaworska, M., J. Sepiol, and P. Tomasik. Effect of Metal Ions Under Laboratory Conditions on the Entomopathogenic Steinernema carpocapsae (Rhabditida: Steinernematidae). Water Air Soil Pollut.88(3-4): 331-341.
Cadmium chloride (CdCl2)	Nematode	Worms	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	uM	LAB	1989. Van Kessel, W.H.M., R.W. Brocades Zaalberg, and W. Seinen. Testing Environmental Pollutants on Soil Organisms: A Simple Assay to Investigate the Toxicity of Environmental Pollutants on Soil Organisms, Using CdCl2 and Nematodes. Ecotoxicol. Environ. Saf.18: 181-190.
Nitric acid, Cadmium salt	Northern House Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4400	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Cadmium chloride (CdCl2)	Northern Pink Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17000	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Northern Pink Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8600	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Northern Pink Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4900	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	55000	NR	NR	ug/L	LAB	1996. Dutta, T.K., and A. Kaviraj. Effects of Lime Acclimation on the Susceptibility of Two Freshwater Teleosts and One Oligochaete Worm to Metallic Pollutant Cadmium. Folia Biol.44(3-4): 143-148.
Cadmium chloride (CdCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	1200	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1984. Niederlehner, B.R., A.L.,Jr. Buikema, C.A. Pittinger, and J.,Jr. Cairns. Effects of Cadmium on the Population Growth of a Benthic Invertebrate Aeolosoma headleyi (Oligochaeta). Environ. Toxicol. Chem.3(2): 255-262.
Cadmium chloride (CdCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	4980	NA	NR	ug/L	LAB	1984. Niederlehner, B.R., A.L.,Jr. Buikema, C.A. Pittinger, and J.,Jr. Cairns. Effects of Cadmium on the Population Growth of a Benthic Invertebrate Aeolosoma headleyi (Oligochaeta). Environ. Toxicol. Chem.3(2): 255-262.
Cadmium chloride (CdCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	36580	NR	NR	ug/L	LAB	1994. Das, B.K., and A. Kaviraj. Individual and Interactive Lethal Toxicity of Cadmium, Potassium Permanganate and Cobalt Chloride to Fish, Worm and Plankton. Geobios21(4): 223-227.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	5700	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	7400	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	630	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	450	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	550	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	7500	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Sulfuric acid, Cadmium salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Nitric acid, Cadmium salt	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	48550	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	58020	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	68730	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Cadmium salt	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	77560	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	85530	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	85760	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	86418	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	88780	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Cadmium	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	4600	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	1700	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium	Oligochaete	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	12500	NR	NR	ug/L	LAB	1999. Deeds, J.R., and P.L. Klerks. Metallothionein-like Proteins in the Freshwater Oligochaete Limnodrilus udekemianus and Their Role as a Homeostatic Mechanism Against Cadmium Toxicity. Environ. Pollut.106(3): 381-389.
Cadmium	Oligochaete	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	12000	NR	NR	ug/L	LAB	1999. Deeds, J.R., and P.L. Klerks. Metallothionein-like Proteins in the Freshwater Oligochaete Limnodrilus udekemianus and Their Role as a Homeostatic Mechanism Against Cadmium Toxicity. Environ. Pollut.106(3): 381-389.
Nitric acid, Cadmium salt	Oligochaete Family	Worms	Fresh	Mortality	LC50	Not Reported	T	3090*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Cadmium	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	158	NA	NR	ug/L	LAB	1995. Phipps, G.L., V.R. Mattson, and G.T. Ankley. Relative Sensitivity of Three Freshwater Benthic Macroinvertebrates to Ten Contaminants. Arch. Environ. Contam. Toxicol.28(3): 281-286.
Cadmium chloride (CdCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
Cadmium chloride (CdCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	74	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
Nitric acid, Cadmium salt	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	780	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Cadmium salt	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	780	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Cadmium salt	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	780	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Cadmium chloride (CdCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Limb Regeneration in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.27(3): 318-322.
Cadmium chloride (CdCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	278	NA	NR	ug/L	LAB	1991. Carlson, A.R., G.L. Phipps, V.R. Mattson, P.A. Kosian, and A.M. Cotter. The Role of Acid-Volatile Sulfide in Determining Cadmium Bioavailability and Toxicity in Freshwater Sediments. Environ. Toxicol. Chem.10: 1309-1319.
Cadmium	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12660	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Cadmium	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6981	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Cadmium	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3020	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Cadmium	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	687.4	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Cadmium chloride (CdCl2)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1978. Fennikoh, K.B., H.I. Hirshfield, and T.J. Kneip. Cadmium Toxicity in Planktonic Organisms of a Freshwater Food Web. Environ. Res.15(3): 357-367.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	34	NA	NR	ug/L	LAB	1996. Onuoha, G.C., F.O. Nwadukwe, and E.S. Erondu. Comparative Toxicity of Cadmium to Crustacean Zooplankton (Copepods and Ostracods). Environ. Ecol.14(3): 557-562.
Cadmium chloride (CdCl2)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	42	NA	NR	ug/L	LAB	1996. Onuoha, G.C., F.O. Nwadukwe, and E.S. Erondu. Comparative Toxicity of Cadmium to Crustacean Zooplankton (Copepods and Ostracods). Environ. Ecol.14(3): 557-562.
Cadmium chloride (CdCl2)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Cadmium chloride (CdCl2)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Cadmium chloride (CdCl2)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4340		NC	ug/L	LAB	1995. Brooks, A., R.M. White, and D.C. Paton. Effects of Heavy Metals on the Survival of Diacypris compacta (Herbst) (Ostracoda) from the Coorong, South Australia. Int. J. Salt Lake Res.4(2): 133-163.
Cadmium chloride (CdCl2)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1090		NC	ug/L	LAB	1995. Brooks, A., R.M. White, and D.C. Paton. Effects of Heavy Metals on the Survival of Diacypris compacta (Herbst) (Ostracoda) from the Coorong, South Australia. Int. J. Salt Lake Res.4(2): 133-163.
Sulfuric acid, Cadmium salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11500	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3100	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	4500	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	25	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Cadmium chloride (CdCl2)	Ostracod	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1996. Onuoha, G.C., F.O. Nwadukwe, and E.S. Erondu. Comparative Toxicity of Cadmium to Crustacean Zooplankton (Copepods and Ostracods). Environ. Ecol.14(3): 557-562.
Cadmium chloride (CdCl2)	Ostracod	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	10	NA	NR	ug/L	LAB	1996. Onuoha, G.C., F.O. Nwadukwe, and E.S. Erondu. Comparative Toxicity of Cadmium to Crustacean Zooplankton (Copepods and Ostracods). Environ. Ecol.14(3): 557-562.
Cadmium chloride (CdCl2)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	112	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Cadmium chloride (CdCl2)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	114	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Cadmium chloride (CdCl2)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	82	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Cadmium chloride (CdCl2)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	93	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Cadmium chloride (CdCl2)	Pea Cockle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1370	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Pea Cockle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	480	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Pea Cockle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	46	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Cadmium chloride (CdCl2)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	69	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Cadmium chloride (CdCl2)	Planaria	Worms	Fresh	Growth	NR	Heart	T	NR	NR	NR	ug/L	LAB	1998. Calevro, F., C. Filippi, P. Deri, C. Albertosi, and R. Batistoni. Toxic Effects of Aluminium, Chromium and Cadmium in Intact and Regenerating Freshwater Planarians. Chemosphere37(4): 651-659.
Cadmium chloride (CdCl2)	Planaria	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Calevro, F., C. Filippi, P. Deri, C. Albertosi, and R. Batistoni. Toxic Effects of Aluminium, Chromium and Cadmium in Intact and Regenerating Freshwater Planarians. Chemosphere37(4): 651-659.
Nitric acid, Cadmium salt	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	2700	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Cadmium chloride (CdCl2)	Polychaete Worm	Worms	NR	Mortality	LC50	Not Reported	T	66630	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Polychaete Worm	Worms	NR	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Polychaete Worm	Worms	NR	Mortality	LC50	Not Reported	T	33560	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Polychaete Worm	Worms	NR	Mortality	LC50	Not Reported	T	46040	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Polychaete Worm	Worms	NR	Mortality	LC50	Not Reported	T	8210	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Polychaete Worm	Worms	NR	Mortality	LC50	Not Reported	T	30150	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Polychaete Worm	Worms	NR	Mortality	LC50	Not Reported	T	31840	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Polychaete Worm	Worms	NR	Mortality	LC50	Not Reported	T	4930	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Polychaete Worm	Worms	NR	Mortality	LC50	Not Reported	T	8720	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Sulfuric acid, Cadmium salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7620	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid, Cadmium salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2630	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid, Cadmium salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1040	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid, Cadmium salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	872	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid, Cadmium salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3410	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid, Cadmium salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid, Cadmium salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid, Cadmium salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1520	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Cadmium	Pouch Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	7600	NA	NR	ug/L	LAB	1976. Wier, C.F., and W.M. Walter. Toxicity of Cadmium in the Freshwater Snail, Physa gyrina Say. J. Environ. Qual.5(4): 359-362.
Cadmium	Pouch Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	4250	NA	NR	ug/L	LAB	1976. Wier, C.F., and W.M. Walter. Toxicity of Cadmium in the Freshwater Snail, Physa gyrina Say. J. Environ. Qual.5(4): 359-362.
Cadmium	Pouch Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	690	NA	NR	ug/L	LAB	1976. Wier, C.F., and W.M. Walter. Toxicity of Cadmium in the Freshwater Snail, Physa gyrina Say. J. Environ. Qual.5(4): 359-362.
Cadmium	Pouch Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	1370	NA	NR	ug/L	LAB	1976. Wier, C.F., and W.M. Walter. Toxicity of Cadmium in the Freshwater Snail, Physa gyrina Say. J. Environ. Qual.5(4): 359-362.
Cadmium	Pouch Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	410	NA	NR	ug/L	LAB	1976. Wier, C.F., and W.M. Walter. Toxicity of Cadmium in the Freshwater Snail, Physa gyrina Say. J. Environ. Qual.5(4): 359-362.
Cadmium	Pouch Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	830	NA	NR	ug/L	LAB	1976. Wier, C.F., and W.M. Walter. Toxicity of Cadmium in the Freshwater Snail, Physa gyrina Say. J. Environ. Qual.5(4): 359-362.
Cadmium	Pouch Snail	Molluscs	Fresh	Reproduction	NR		T	NR	NA	NR	ug/L	LAB	1976. Wier, C.F., and W.M. Walter. Toxicity of Cadmium in the Freshwater Snail, Physa gyrina Say. J. Environ. Qual.5(4): 359-362.
Cadmium chloride (CdCl2)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	34*	NA	NR	ug/L	LAB	1986. Patil, H.S., and M.B. Kaliwal. Relative Sensitivity of a Freshwater Prawn Macrobrachium hendersodyanum to Heavy Metals. Environ. Ecol.4(2): 286-288.
Cadmium chloride (CdCl2)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	183*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Acute Toxicity of Mercuric Chloride and Cadmium Chloride to Freshwater Prawn, Macrobrachium lamarrei (H. Milne Edwards). Acta Hydrochim. Hydrobiol.12(6): 689-692.
Cadmium chloride (CdCl2)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	142*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Acute Toxicity of Mercuric Chloride and Cadmium Chloride to Freshwater Prawn, Macrobrachium lamarrei (H. Milne Edwards). Acta Hydrochim. Hydrobiol.12(6): 689-692.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	109*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Acute Toxicity of Mercuric Chloride and Cadmium Chloride to Freshwater Prawn, Macrobrachium lamarrei (H. Milne Edwards). Acta Hydrochim. Hydrobiol.12(6): 689-692.
Cadmium chloride (CdCl2)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	96*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Acute Toxicity of Mercuric Chloride and Cadmium Chloride to Freshwater Prawn, Macrobrachium lamarrei (H. Milne Edwards). Acta Hydrochim. Hydrobiol.12(6): 689-692.
Cadmium chloride (CdCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1810	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Cadmium chloride (CdCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Cadmium chloride (CdCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	590	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Cadmium chloride (CdCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2760	NA	NR	ug/L	LAB	1997. Salvado, H., M.P. Gracia, J.M. Amigo, and M. Rius. Effects of Cadmium on Growth and Motility in Euplotes aediculatus Isolated from Activated Sludge. Bull. Environ. Contam. Toxicol.58: 838-844.
Cadmium chloride (CdCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1770	NA	NR	ug/L	LAB	1997. Salvado, H., M.P. Gracia, J.M. Amigo, and M. Rius. Effects of Cadmium on Growth and Motility in Euplotes aediculatus Isolated from Activated Sludge. Bull. Environ. Contam. Toxicol.58: 838-844.
Cadmium chloride (CdCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	710	NA	NR	ug/L	LAB	1997. Salvado, H., M.P. Gracia, J.M. Amigo, and M. Rius. Effects of Cadmium on Growth and Motility in Euplotes aediculatus Isolated from Activated Sludge. Bull. Environ. Contam. Toxicol.58: 838-844.
Cadmium chloride (CdCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Cadmium chloride (CdCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2650	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Cadmium chloride (CdCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Cadmium chloride (CdCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	620	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Sulfuric acid, Cadmium salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid, Cadmium salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid, Cadmium salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid, Cadmium salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid, Cadmium salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5270	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid, Cadmium salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	78.1	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid, Cadmium salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid, Cadmium salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Nitric acid, Cadmium salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	197	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Nitric acid, Cadmium salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	168	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Cadmium chloride (CdCl2)	Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	194	NR	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Cadmium	Protozoan Phylum	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Fernandez-Leborans, G., and A. Novillo-Villajos. Changes in Trophic Structure of a Freshwater Protozoan Community Subjected to Cadmium. Ecotoxicol. Environ. Saf.25: 271-279.
Cadmium chloride (CdCl2)	Protozoan Phylum	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Cadmium	Quiver Fly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	9000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Cadmium	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Cadmium	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Cadmium	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Cadmium	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Cadmium	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Cadmium	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Cadmium	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Cadmium chloride (CdCl2)	Ramshorn Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Carlson, A.R., G.L. Phipps, V.R. Mattson, P.A. Kosian, and A.M. Cotter. The Role of Acid-Volatile Sulfide in Determining Cadmium Bioavailability and Toxicity in Freshwater Sediments. Environ. Toxicol. Chem.10: 1309-1319.
Cadmium chloride (CdCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1040	NA	NR	ug/L	LAB	1993. Naqvi, S.M., and R.D. Howell. Toxicity of Cadmium and Lead to Juvenile Red Swamp Crayfish, Procambarus clarkii, and Effects on Fecundity of Adults. Bull. Environ. Contam. Toxicol.51: 303-308.
Cadmium chloride (CdCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58000	NA	NR	ug/L	LAB	1995. Del Ramo, J., A. Torreblanca, M. Martinez, A. Pastor, and J. Diaz-Mayans. Quantification of Cadmium-Induced Metallothionein in Crustaceans by the Silver-Saturation Method. Mar. Environ. Res.39(1-4): 121-125.
Cadmium chloride (CdCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18400	NA	NR	ug/L	LAB	1987. Del Ramo, J., J. Diaz-Mayans, A. Torreblanca, and A. Nunez. Effects of Temperature on the Acute Toxicity of Heavy Metals (Cr, Cd, and Hg) to the Freshwater Crayfish, Procambarus clarkii (Girard). Bull. Environ. Contam. Toxicol.38(5): 736-741.
Cadmium chloride (CdCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	34800	NA	NR	ug/L	LAB	1987. Del Ramo, J., J. Diaz-Mayans, A. Torreblanca, and A. Nunez. Effects of Temperature on the Acute Toxicity of Heavy Metals (Cr, Cd, and Hg) to the Freshwater Crayfish, Procambarus clarkii (Girard). Bull. Environ. Contam. Toxicol.38(5): 736-741.
Cadmium chloride (CdCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58500	NA	NR	ug/L	LAB	1987. Del Ramo, J., J. Diaz-Mayans, A. Torreblanca, and A. Nunez. Effects of Temperature on the Acute Toxicity of Heavy Metals (Cr, Cd, and Hg) to the Freshwater Crayfish, Procambarus clarkii (Girard). Bull. Environ. Contam. Toxicol.38(5): 736-741.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1993. Naqvi, S.M., and R.D. Howell. Toxicity of Cadmium and Lead to Juvenile Red Swamp Crayfish, Procambarus clarkii, and Effects on Fecundity of Adults. Bull. Environ. Contam. Toxicol.51: 303-308.
Cadmium chloride (CdCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1986. Diaz-Mayans, J., A. Torreblanca, J. Del Ramo, and A. Nunez. Oxygen Uptake by Excised Gills of Procambarus clarkii (Girard) From Albufera Lake of Valencia, Spain, Under Heavy Metal Treatments. Bull. Environ. Contam. Toxicol.36(6): 912-917.
Cadmium chloride (CdCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Martinez, M., A. Torreblanca, J. Del Ramo, A. Pastor, and J. Diaz-Mayans. Cadmium Induced Metallothionein in Hepatopancreas of Procambarus clarkii: Quantification by a Silver-Saturation Method. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.105(2): 263-267.
Cadmium chloride (CdCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1993. Naqvi, S.M., and R.D. Howell. Toxicity of Cadmium and Lead to Juvenile Red Swamp Crayfish, Procambarus clarkii, and Effects on Fecundity of Adults. Bull. Environ. Contam. Toxicol.51: 303-308.
Cadmium chloride (CdCl2)	Ridged-Beak Peaclam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2080	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Ridged-Beak Peaclam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	360	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Ridged-Beak Peaclam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Growth	LOEC	Whole Organism	T	25	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Growth	LOEC	Whole Organism	T	50	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Growth	NOEC	Whole Organism	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Growth	NOEC	Whole Organism	T	25	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Growth	NOEC	Whole Organism	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Cadmium	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Cadmium	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1991. Snell, T.W., B.D. Moffat, C. Janssen, and G. Persoone. Acute Toxicity Tests Using Rotifers IV. Effects of Cyst Age, Temperature, and Salinity on the Sensitivity of Brachionus calyciflorus. Ecotoxicol. Environ. Saf.21(3): 308-317.
Cadmium	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Cadmium	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sarma, S.S.S., T. Ramirez Perez, and S. Nandini. Comparison of the Sensitivitiy of Branchionus calyciflorus and Branchionus patulus (Rotifera) to Selected Heavy Metals Under Low and high Food (Chlorella vulgaris) Levels. Bull. Environ. Contam. Toxicol.64(5): 735-739.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sarma, S.S.S., T. Ramirez Perez, and S. Nandini. Comparison of the Sensitivitiy of Branchionus calyciflorus and Branchionus patulus (Rotifera) to Selected Heavy Metals Under Low and high Food (Chlorella vulgaris) Levels. Bull. Environ. Contam. Toxicol.64(5): 735-739.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	650	NA	NR	ug/L	LAB	1989. Couillard, Y., P. Ross, and B. Pinel-Alloul. Acute Toxicity of Six Metals to the Rotifer Brachionus calyciflorus, with Comparisons to Other Freshwater Organisms. Toxic. Assess.4(4): 451-462.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	419		NC	ug/L	LAB	2007. Juarez-Franco, M.F., S.S.S. Sarma, and S. Nandini. Effect of Cadmium and Zinc on the Population Growth of Brachionus havanaensis (Rotifera: Brachionidae). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control42(10): 1489-1493.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sarma, S.S.S., T. Ramirez Perez, and S. Nandini. Comparison of the Sensitivitiy of Branchionus calyciflorus and Branchionus patulus (Rotifera) to Selected Heavy Metals Under Low and high Food (Chlorella vulgaris) Levels. Bull. Environ. Contam. Toxicol.64(5): 735-739.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sarma, S.S.S., T. Ramirez Perez, and S. Nandini. Comparison of the Sensitivitiy of Branchionus calyciflorus and Branchionus patulus (Rotifera) to Selected Heavy Metals Under Low and high Food (Chlorella vulgaris) Levels. Bull. Environ. Contam. Toxicol.64(5): 735-739.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	810	NA	NR	ug/L	LAB	1989. Snell, T.W., and G. Persoone. Acute Toxicity Bioassays Using Rotifers. II. A Freshwater Test with Brachionus rubens. Aquat. Toxicol.14(1): 81-92.
Sulfuric acid, Cadmium salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1994. Crisinel, A., L. Delaunay, D. Rossel, J. Tarradellas, H. Meyer, H. Saiah, P. Vogel, C. Delisle, and C. Blaise. Cyst-Based Ecotoxicological Tests Using Anostracans: Comparison of Two Species of Streptocephalus. Environ. Toxicol. Water Qual.9(4): 317-326.
Nitric acid, Cadmium salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1115.6	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	280	NA	NR	ug/L	LAB	1989. Snell, T.W., and G. Persoone. Acute Toxicity Bioassays Using Rotifers. II. A Freshwater Test with Brachionus rubens. Aquat. Toxicol.14(1): 81-92.
Nitric acid, Cadmium salt	Rotifer	Invertebrates	Fresh	Reproduction	EC10	Not Reported	T	2.6	NR	NR	ug/L	LAB	1999. Radix, P., M. Leonard, C. Papantoniou, G. Roman, E. Saouter, S. Gallotti-Schmitt, H. Thiebaud, and P. Vasseur. Comparison of Brachionus calyciflorus 2-D and Microtox Chronic 22-H Tests with Daphnia magna 21-D Test for the Chronic Toxicity Assessment of Chemicals. Environ. Toxicol. Chem.18(10): 2178-2185.
Nitric acid, Cadmium salt	Rotifer	Invertebrates	Fresh	Reproduction	EC20	Not Reported	T	4.4	NR	NR	ug/L	LAB	1999. Radix, P., M. Leonard, C. Papantoniou, G. Roman, E. Saouter, S. Gallotti-Schmitt, H. Thiebaud, and P. Vasseur. Comparison of Brachionus calyciflorus 2-D and Microtox Chronic 22-H Tests with Daphnia magna 21-D Test for the Chronic Toxicity Assessment of Chemicals. Environ. Toxicol. Chem.18(10): 2178-2185.
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	EC50	Not Reported	T	70	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Nitric acid, Cadmium salt	Rotifer	Invertebrates	Fresh	Reproduction	EC50	Not Reported	T	10	NR	NR	ug/L	LAB	1999. Radix, P., M. Leonard, C. Papantoniou, G. Roman, E. Saouter, S. Gallotti-Schmitt, H. Thiebaud, and P. Vasseur. Comparison of Brachionus calyciflorus 2-D and Microtox Chronic 22-H Tests with Daphnia magna 21-D Test for the Chronic Toxicity Assessment of Chemicals. Environ. Toxicol. Chem.18(10): 2178-2185.
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	80	NA	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	25	NA	NR	ug/L	LAB	1995. Snell, T.W., and M.J. Carmona. Comparative Toxicant Sensitivity of Sexual and Asexual Reproduction in the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.14(3): 415-420.
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	25	NA	NR	ug/L	LAB	1995. Snell, T.W., and M.J. Carmona. Comparative Toxicant Sensitivity of Sexual and Asexual Reproduction in the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.14(3): 415-420.
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	80	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	MATC	Not Reported	T	20	NA	NR	ug/L	LAB	1995. Snell, T.W., and M.J. Carmona. Comparative Toxicant Sensitivity of Sexual and Asexual Reproduction in the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.14(3): 415-420.
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	MATC	Not Reported	T	20	NA	NR	ug/L	LAB	1995. Snell, T.W., and M.J. Carmona. Comparative Toxicant Sensitivity of Sexual and Asexual Reproduction in the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.14(3): 415-420.
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2000. Preston, B.L., T.W. Snell, T.L. Robertson, and B.J. Dingmann. Use of Freshwater Rotifer Brachionus calyciflorus in Screening Assay for Potential Endocrine Disruptors. Environ. Toxicol. Chem.19(12): 2923-2928.
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	18	NA	NR	ug/L	LAB	1995. Snell, T.W., and M.J. Carmona. Comparative Toxicant Sensitivity of Sexual and Asexual Reproduction in the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.14(3): 415-420.
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	18	NA	NR	ug/L	LAB	1995. Snell, T.W., and M.J. Carmona. Comparative Toxicant Sensitivity of Sexual and Asexual Reproduction in the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.14(3): 415-420.
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	40	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Nitric acid, Cadmium salt	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	0.4	NR	NR	ug/L	LAB	1999. Radix, P., M. Leonard, C. Papantoniou, G. Roman, E. Saouter, S. Gallotti-Schmitt, H. Thiebaud, and P. Vasseur. Comparison of Brachionus calyciflorus 2-D and Microtox Chronic 22-H Tests with Daphnia magna 21-D Test for the Chronic Toxicity Assessment of Chemicals. Environ. Toxicol. Chem.18(10): 2178-2185.
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	10	NR	NR	ug/L	LAB	2000. Preston, B.L., T.W. Snell, T.L. Robertson, and B.J. Dingmann. Use of Freshwater Rotifer Brachionus calyciflorus in Screening Assay for Potential Endocrine Disruptors. Environ. Toxicol. Chem.19(12): 2923-2928.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	500000	NA	NR	ug/L	LAB	1986. Hatakeyama, S.. Effects of Heavy Metals Cadmium, Copper, and Zinc on Some Aquatic Organisms Through the Food Chain. C. A. Sel. -Environ. Pollut.22: 105.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Cadmium chloride (CdCl2)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Cadmium chloride (CdCl2)	Santo Domingo Falsemussel	Molluscs	NR	Mortality	LC50	Not Reported	T	346.7	NA	NR	ug/L	LAB	1994. Kumari, V., V. Hanna, K.H. Rao, and K.S. Sundari. Histopathological Changes in Target Tissues of Mytilopsis sallei (Recluz) Exposed to Cadmium. In: M.F.Thompson, R.Nagabhushanam, R.Sarojini, and M.Fingerman (Eds.), Recent Developments in Biofouling Control, Oxford & IBH Publ.Co., New Delhi, India: 107-114.
Cadmium	Scud	Crustaceans	Fresh	Growth	EC25	Whole Organism	T	2.82	NR	NR	mol/g foc	LAB	2006. Ball, A.L., U. Borgmann, and D.G. Dixon. Toxicity of a Cadmium-Contaminated Diet to Hyalella azteca. Environ. Toxicol. Chem.25(9): 2526-2532.
Cadmium	Scud	Crustaceans	Fresh	Growth	EC50	Whole Organism	T	5.43	NR	NR	mol/g foc	LAB	2006. Ball, A.L., U. Borgmann, and D.G. Dixon. Toxicity of a Cadmium-Contaminated Diet to Hyalella azteca. Environ. Toxicol. Chem.25(9): 2526-2532.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	2	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium	Scud	Crustaceans	Fresh	Growth	NR		T	2.23	NA	NR	ug/L	LAB	1989. Borgmann, U., K.M. Ralph, and W.P. Norwood. Toxicity Test Procedures for Hyalella azteca, and Chronic Toxicity of Cadmium and Pentachlorophenol to H. azteca, Gammarus fasciatus, and Daphnia magna. Arch. Environ. Contam. Toxicol.18(5): 756-764.
Cadmium	Scud	Crustaceans	Fresh	Growth	NR		T	3.42	NA	NR	ug/L	LAB	1989. Borgmann, U., K.M. Ralph, and W.P. Norwood. Toxicity Test Procedures for Hyalella azteca, and Chronic Toxicity of Cadmium and Pentachlorophenol to H. azteca, Gammarus fasciatus, and Daphnia magna. Arch. Environ. Contam. Toxicol.18(5): 756-764.
Cadmium	Scud	Crustaceans	Fresh	Growth	NR	Not Reported	T	5610	NR	NR	mol/g foc	LAB	2006. Ball, A.L., U. Borgmann, and D.G. Dixon. Toxicity of a Cadmium-Contaminated Diet to Hyalella azteca. Environ. Toxicol. Chem.25(9): 2526-2532.
Cadmium	Scud	Crustaceans	Fresh	Growth	NR	Not Reported	T	0.34	NA	NR	ug/L	LAB	1991. Borgmann, U., W.P. Norwood, and I.M. Babirad. Relationship Between Chronic Toxicity and Bioaccumulation of Cadmium in Hyalella azteca. Can. J. Fish. Aquat. Sci.48(6): 1055-1060.
Cadmium	Scud	Crustaceans	Fresh	Growth	NR		T	2.23	NA	NR	ug/L	LAB	1989. Borgmann, U., K.M. Ralph, and W.P. Norwood. Toxicity Test Procedures for Hyalella azteca, and Chronic Toxicity of Cadmium and Pentachlorophenol to H. azteca, Gammarus fasciatus, and Daphnia magna. Arch. Environ. Contam. Toxicol.18(5): 756-764.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC25	Not Reported	T	NR	NR	NR	mol/g foc	LAB	2006. Ball, A.L., U. Borgmann, and D.G. Dixon. Toxicity of a Cadmium-Contaminated Diet to Hyalella azteca. Environ. Toxicol. Chem.25(9): 2526-2532.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40.1	NA	NR	ug/L	LAB	1988. De March, B.G.E.. Acute Toxicity of Binary Mixtures of Five Cations (Cu2+, Cd2+, Zn2+, Mg2+, and K+) to the Freshwater Amphipod Gammarus lacustris (Sars): Alternative Descriptive Models. Can. J. Fish. Aquat. Sci.45(4): 625-633.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.8	NA	NR	ug/L	LAB	1995. Phipps, G.L., V.R. Mattson, and G.T. Ankley. Relative Sensitivity of Three Freshwater Benthic Macroinvertebrates to Ten Contaminants. Arch. Environ. Contam. Toxicol.28(3): 281-286.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.15	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.41	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	370	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15400	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46500	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	69100	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	740	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23600	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	410	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	57400	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8300	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17500	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	49400	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6700	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1992. Gossiaux, D.C., P.F. Landrum, and V.N. Tsymbal. Response of the Amphipod Diporeia spp. to Various Stressors: Cadmium, Salinity, and Temperature. J. Great Lakes Res.18(3): 364-371.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	44.15		NC	ug/L	LAB	2007. Pestana, J.L.T., A. Re, A.J.A. Nogueira, and A.M.V.M. Soares. Effects of Cadmium and Zinc on the Feeding Behaviour of Two Freshwater Crustaceans: Atyaephyra desmarestii (Decapoda) and Echinogammarus meridionalis (Amphipoda). Chemosphere68(8): 1556-1562.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	82	NA	NR	ug/L	LAB	1990. Musko, I.B., W. Meinel, R. Krause, and M. Barlas. The Impact of Cd and Different pH on the Amphipod Gammarus fossarum Koch (Crustacea: Amphipoda). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.96(1): 11-16.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1988. Abel, T., and F. Baerlocher. Uptake of Cadmium by Gammarus fossarum (Amphipoda) From Food and Water. J. Appl. Ecol.25(1): 223-231.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1988. Abel, T., and F. Baerlocher. Uptake of Cadmium by Gammarus fossarum (Amphipoda) From Food and Water. J. Appl. Ecol.25(1): 223-231.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1990. Musko, I.B., W. Meinel, R. Krause, and M. Barlas. The Impact of Cd and Different pH on the Amphipod Gammarus fossarum Koch (Crustacea: Amphipoda). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.96(1): 11-16.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1988. Abel, T., and F. Baerlocher. Uptake of Cadmium by Gammarus fossarum (Amphipoda) From Food and Water. J. Appl. Ecol.25(1): 223-231.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1988. Abel, T., and F. Baerlocher. Uptake of Cadmium by Gammarus fossarum (Amphipoda) From Food and Water. J. Appl. Ecol.25(1): 223-231.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.2	NA	NR	ug/L	LAB	1990. Musko, I.B., W. Meinel, R. Krause, and M. Barlas. The Impact of Cd and Different pH on the Amphipod Gammarus fossarum Koch (Crustacea: Amphipoda). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.96(1): 11-16.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1988. Abel, T., and F. Baerlocher. Uptake of Cadmium by Gammarus fossarum (Amphipoda) From Food and Water. J. Appl. Ecol.25(1): 223-231.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1988. Abel, T., and F. Baerlocher. Uptake of Cadmium by Gammarus fossarum (Amphipoda) From Food and Water. J. Appl. Ecol.25(1): 223-231.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4750	NA	NR	ug/L	LAB	1990. Pantani, C., P.F. Ghetti, A. Cavacini, and P. Muccioni. Acute Toxicity of Equitoxic Binary Mixtures of Some Metals, Surfactants and Pesticides to the Freshwater Amphipod Gammarus italicus Goedm.. Environ. Technol.11(12): 1143-1146.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	910	NA	NR	ug/L	LAB	1997. Pantani, C., G. Pannunzio, M. De Cristofaro, A.A. Novelli, and M. Salvatori. Comparative Acute Toxicity of Some Pesticides, Metals, and Surfactants to Gammarus italicus Goedm. and Echinogammarus tibaldii Pink. and Stock (Crustacea: Amphipoda). Bull. Environ. Contam. Toxicol.59(6): 963-967.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	22	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 74 p..
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	49	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 74 p..
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	62	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 74 p..
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	54.4	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	68.3	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Increased Sensitivity to Cadmium of the Freshwater Amphipod Gammarus pulex (L.) During the Reproductive Period. Aquat. Toxicol.13(3): 183-194.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1988. McCahon, C.P., A.F. Brown, and D. Pascoe. The Effect of the Acanthocephalan Pomphorhynchus Laevis (Mueller 1776) on the Acute Toxicity of Cadmium to its Intermediate Host, the Amphipod. Arch. Environ. Contam. Toxicol.17(2): 239-243.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	122	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Cadmium Toxicity to the Freshwater Amphipod Gammarus pulex (L.) During the Moult Cycle. Freshw. Biol.19(2): 197-203.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Increased Sensitivity to Cadmium of the Freshwater Amphipod Gammarus pulex (L.) During the Reproductive Period. Aquat. Toxicol.13(3): 183-194.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Increased Sensitivity to Cadmium of the Freshwater Amphipod Gammarus pulex (L.) During the Reproductive Period. Aquat. Toxicol.13(3): 183-194.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1988. McCahon, C.P., A.F. Brown, and D. Pascoe. The Effect of the Acanthocephalan Pomphorhynchus Laevis (Mueller 1776) on the Acute Toxicity of Cadmium to its Intermediate Host, the Amphipod. Arch. Environ. Contam. Toxicol.17(2): 239-243.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Increased Sensitivity to Cadmium of the Freshwater Amphipod Gammarus pulex (L.) During the Reproductive Period. Aquat. Toxicol.13(3): 183-194.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	680	NA	NR	ug/L	LAB	1981. Wright, D.A., and J.W. Frain. The Effect of Calcium on Cadmium Toxicity in the Freshwater Amphipod, Gammarus pulex (L.). Arch. Environ. Contam. Toxicol.10(3): 321-328.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3140	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Cadmium Toxicity to the Freshwater Amphipod Gammarus pulex (L.) During the Moult Cycle. Freshw. Biol.19(2): 197-203.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	44	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Cadmium Toxicity to the Freshwater Amphipod Gammarus pulex (L.) During the Moult Cycle. Freshw. Biol.19(2): 197-203.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1120	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Cadmium Toxicity to the Freshwater Amphipod Gammarus pulex (L.) During the Moult Cycle. Freshw. Biol.19(2): 197-203.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Cadmium Toxicity to the Freshwater Amphipod Gammarus pulex (L.) During the Moult Cycle. Freshw. Biol.19(2): 197-203.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Increased Sensitivity to Cadmium of the Freshwater Amphipod Gammarus pulex (L.) During the Reproductive Period. Aquat. Toxicol.13(3): 183-194.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Increased Sensitivity to Cadmium of the Freshwater Amphipod Gammarus pulex (L.) During the Reproductive Period. Aquat. Toxicol.13(3): 183-194.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1988. McCahon, C.P., A.F. Brown, and D. Pascoe. The Effect of the Acanthocephalan Pomphorhynchus Laevis (Mueller 1776) on the Acute Toxicity of Cadmium to its Intermediate Host, the Amphipod. Arch. Environ. Contam. Toxicol.17(2): 239-243.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1981. Wright, D.A., and J.W. Frain. The Effect of Calcium on Cadmium Toxicity in the Freshwater Amphipod, Gammarus pulex (L.). Arch. Environ. Contam. Toxicol.10(3): 321-328.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1170	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Cadmium Toxicity to the Freshwater Amphipod Gammarus pulex (L.) During the Moult Cycle. Freshw. Biol.19(2): 197-203.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Cadmium Toxicity to the Freshwater Amphipod Gammarus pulex (L.) During the Moult Cycle. Freshw. Biol.19(2): 197-203.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1790	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	375	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	980	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	25	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	370	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	430	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4700	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	710	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	221	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	94	NA	NR	ug/L	LAB	1988. McCahon, C.P., and D. Pascoe. Use of Gammarus pulex (L.) in Safety Evaluation Tests: Culture and Selection of a Sensitive Life Stage. Ecotoxicol. Environ. Saf.15(3): 245-252.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	55	NA	NR	ug/L	LAB	1997. Werner, I., and R. Nagel. Stress Proteins HSP60 and HSP70 in Three Species of Amphipods Exposed to Cadmium, Diazinon, Dieldrin and Fluoranthene. Environ. Toxicol. Chem.16(11): 2393-2403.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.2	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.65	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	162	NR	NR	ug/L	LAB	1999. McNulty, E.W., F.J. Dwyer, M.R. Ellersieck, E.I. Greer, C.G. Ingersoll, and C.F. Rabeni. Evaluation of Ability of Reference Toxicity Tests to Identify Stress in Laboratory Populations of the Amphipod Hyalella azteca. Environ. Toxicol. Chem.18(3): 544-548.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	175	NR	NR	ug/L	LAB	1999. McNulty, E.W., F.J. Dwyer, M.R. Ellersieck, E.I. Greer, C.G. Ingersoll, and C.F. Rabeni. Evaluation of Ability of Reference Toxicity Tests to Identify Stress in Laboratory Populations of the Amphipod Hyalella azteca. Environ. Toxicol. Chem.18(3): 544-548.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5.6	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	123	NR	NR	ug/L	LAB	1999. McNulty, E.W., F.J. Dwyer, M.R. Ellersieck, E.I. Greer, C.G. Ingersoll, and C.F. Rabeni. Evaluation of Ability of Reference Toxicity Tests to Identify Stress in Laboratory Populations of the Amphipod Hyalella azteca. Environ. Toxicol. Chem.18(3): 544-548.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	134	NR	NR	ug/L	LAB	1999. McNulty, E.W., F.J. Dwyer, M.R. Ellersieck, E.I. Greer, C.G. Ingersoll, and C.F. Rabeni. Evaluation of Ability of Reference Toxicity Tests to Identify Stress in Laboratory Populations of the Amphipod Hyalella azteca. Environ. Toxicol. Chem.18(3): 544-548.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	106	NR	NR	ug/L	LAB	1999. McNulty, E.W., F.J. Dwyer, M.R. Ellersieck, E.I. Greer, C.G. Ingersoll, and C.F. Rabeni. Evaluation of Ability of Reference Toxicity Tests to Identify Stress in Laboratory Populations of the Amphipod Hyalella azteca. Environ. Toxicol. Chem.18(3): 544-548.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	121	NR	NR	ug/L	LAB	1999. McNulty, E.W., F.J. Dwyer, M.R. Ellersieck, E.I. Greer, C.G. Ingersoll, and C.F. Rabeni. Evaluation of Ability of Reference Toxicity Tests to Identify Stress in Laboratory Populations of the Amphipod Hyalella azteca. Environ. Toxicol. Chem.18(3): 544-548.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	74	D	6.6	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8	NR	NR	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 74 p..
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 74 p..

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 74 p..
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 74 p..
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	285	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.8	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	53	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	73	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	74	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	77	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	79	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	81	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	81	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	82	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	84	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	92	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	95	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.7	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	85	NA	NR	ug/L	LAB	1978. Fennikoh, K.B., H.I. Hirshfield, and T.J. Kneip. Cadmium Toxicity in Planktonic Organisms of a Freshwater Food Web. Environ. Res.15(3): 357-367.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26000	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26000	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	27500	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10800	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14000	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7500	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2450	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4500	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6250	NA	NR	ug/L	LAB	1989. Meinel, W., R. Krause, and J. Musko. Effect of pH on the Toxicity of Cadmium to Some Groundwater Organisms. Z. Angew. Zool.76(1): 101-125.
Sulfuric acid, Cadmium salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1974. Thorp, V.J., and P.S. Lake. Toxicity Bioassays of Cadmium on Selected Freshwater Invertebrates and the Interaction of Cadmium and Zinc on the Freshwater Shrimp, Paratya. Aust. J. Mar. Freshw. Res.25(1): 97-104.
Sulfuric acid, Cadmium salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.6	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.7	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Nitric acid, Cadmium salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38.0*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Nitric acid, Cadmium salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Cadmium salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	7650	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	2320	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	2370	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	2490	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	3270	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	4800	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	5080	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	5410	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	6250	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	6460	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	7950	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	1370	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	2020	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	21250	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	2280	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	2330	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	28750	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	3490	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	3750	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	4360	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	4420	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	5750	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium chloride (CdCl2)	Scud	Crustaceans	NR	Mortality	LC50	Not Reported	T	5860	NA	NR	ug/L	LAB	1979. Bellan-Santini, D., G. Bellan, and D.J. Reish. Variations of the Effects of Toxicity According to the Day-Night Cycle of Certain Marine Invertebrates. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.288(1): 139-141.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	0.53	NA	NR	ug/L	LAB	1991. Borgmann, U., W.P. Norwood, and I.M. Babirad. Relationship Between Chronic Toxicity and Bioaccumulation of Cadmium in Hyalella azteca. Can. J. Fish. Aquat. Sci.48(6): 1055-1060.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	1070	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	20	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	249	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	630	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Cadmium	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	85	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	2	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	0.25	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	2	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	10	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	240	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	9	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	1	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	0.1	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	1	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	7		NC	ug/L	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1.49	NA	NR	ug/L	LAB	1989. Borgmann, U., K.M. Ralph, and W.P. Norwood. Toxicity Test Procedures for Hyalella azteca, and Chronic Toxicity of Cadmium and Pentachlorophenol to H. azteca, Gammarus fasciatus, and Daphnia magna. Arch. Environ. Contam. Toxicol.18(5): 756-764.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2.23	NA	NR	ug/L	LAB	1989. Borgmann, U., K.M. Ralph, and W.P. Norwood. Toxicity Test Procedures for Hyalella azteca, and Chronic Toxicity of Cadmium and Pentachlorophenol to H. azteca, Gammarus fasciatus, and Daphnia magna. Arch. Environ. Contam. Toxicol.18(5): 756-764.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5610	NR	NR	mol/g foc	LAB	2006. Ball, A.L., U. Borgmann, and D.G. Dixon. Toxicity of a Cadmium-Contaminated Diet to Hyalella azteca. Environ. Toxicol. Chem.25(9): 2526-2532.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	mol/g foc	LAB	2006. Ball, A.L., U. Borgmann, and D.G. Dixon. Toxicity of a Cadmium-Contaminated Diet to Hyalella azteca. Environ. Toxicol. Chem.25(9): 2526-2532.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	0.57	NA	NR	ug/L	LAB	1989. Borgmann, U., K.M. Ralph, and W.P. Norwood. Toxicity Test Procedures for Hyalella azteca, and Chronic Toxicity of Cadmium and Pentachlorophenol to H. azteca, Gammarus fasciatus, and Daphnia magna. Arch. Environ. Contam. Toxicol.18(5): 756-764.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	0.92	NA	NR	ug/L	LAB	1989. Borgmann, U., K.M. Ralph, and W.P. Norwood. Toxicity Test Procedures for Hyalella azteca, and Chronic Toxicity of Cadmium and Pentachlorophenol to H. azteca, Gammarus fasciatus, and Daphnia magna. Arch. Environ. Contam. Toxicol.18(5): 756-764.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	400	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	104	NR	NR	mol/g foc	LAB	2006. Ball, A.L., U. Borgmann, and D.G. Dixon. Toxicity of a Cadmium-Contaminated Diet to Hyalella azteca. Environ. Toxicol. Chem.25(9): 2526-2532.
Cadmium	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Besser, J.M., C.G. Ingersoll, E.N. Leonard, and D.R. Mount. Effect of Zeolite on Toxicity of Ammonia in Freshwater Sediments: Implications for Toxicity Identification Evaluation Procedures. Environ. Toxicol. Chem.17(11): 2310-2317.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	g/g dry f	LAB	1980. Duddridge, J.E., and M. Wainwright. Heavy Metal Accumulation by Aquatic Fungi and Reduction in Viability of Gammarus pulex Fed Cd2+ Contaminated Mycelium. Water Res.14(11): 1605-1611.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	4	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	6	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	4	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	140	D	72	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium	Scud	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	mol/g foc	LAB	2006. Ball, A.L., U. Borgmann, and D.G. Dixon. Toxicity of a Cadmium-Contaminated Diet to Hyalella azteca. Environ. Toxicol. Chem.25(9): 2526-2532.
Cadmium	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	140	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	70	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid, Cadmium salt (1:1)	Sea Urchin	Invertebrates	NR	Growth	NR		T	2500	NA	NR	ug/L	LAB	1982. Vlasova, G.A., and N.K. Khristoforova. The Effect of Cadmium on Early Ontogenesis of the Sea Urchin Strongylocentrotus intermedius. Biol. Morya (Vladivost.)4: 31-36.
Sulfuric acid, Cadmium salt (1:1)	Sea Urchin	Invertebrates	NR	Mortality	NR-LETH	Not Reported	T	2700*	NA	NR	ug/L	LAB	1983. Gnezdilova, S.M., and Y.V. Shchepin. Histological and Biochemical Changes in a Gonad of the Sea Urchin Strongylocentrotus intermedius Exposed to Cadmium. Biol. Morya (Vladivost.)6: 44-49.
Cadmium chloride (CdCl2)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Cadmium chloride (CdCl2)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	569.6	NA	NR	ug/L	LAB	1984. Ghate, H.V.. Gill Melanization and Heavy Metals in Freshwater Prawns. Indian J. Fish.31(3): 389-393.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1974. Thorp, V.J., and P.S. Lake. Toxicity Bioassays of Cadmium on Selected Freshwater Invertebrates and the Interaction of Cadmium and Zinc on the Freshwater Shrimp, Paratya. Aust. J. Mar. Freshw. Res.25(1): 97-104.
Sulfuric acid, Cadmium salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1974. Thorp, V.J., and P.S. Lake. Toxicity Bioassays of Cadmium on Selected Freshwater Invertebrates and the Interaction of Cadmium and Zinc on the Freshwater Shrimp, Paratya. Aust. J. Mar. Freshw. Res.25(1): 97-104.
Cadmium chloride (CdCl2)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Cadmium chloride (CdCl2)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Cadmium chloride (CdCl2)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Cadmium chloride (CdCl2)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	760	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Growth	EC50	Not Reported	T	16	NA	NR	ug/L	LAB	1995. Dorgelo, J., H. Meester, and C. Van Velzen. Effects of Diet and Heavy Metals on Growth Rate and Fertility in the Deposit-Feeding Snail Potamopyrgus jenkinsi (Smith) (Gastropoda: Hydrobiidae). Hydrobiologia316(3): 199-210.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Growth	LOEC	Not Reported	T	23.3	NA	NR	ug/L	LAB	1995. Dorgelo, J., H. Meester, and C. Van Velzen. Effects of Diet and Heavy Metals on Growth Rate and Fertility in the Deposit-Feeding Snail Potamopyrgus jenkinsi (Smith) (Gastropoda: Hydrobiidae). Hydrobiologia316(3): 199-210.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2006. Schirling, M., A. Bohlen, R. Triebskorn, and H.R. Kohler. An Invertebrate Embryo Test with the Apple Snail Marisa cornuarietis to Assess Effects of Potential Developmental and Endocrine Disruptors. Chemosphere64(10): 1730-1738.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	T	7	NA	NR	ug/L	LAB	1995. Dorgelo, J., H. Meester, and C. Van Velzen. Effects of Diet and Heavy Metals on Growth Rate and Fertility in the Deposit-Feeding Snail Potamopyrgus jenkinsi (Smith) (Gastropoda: Hydrobiidae). Hydrobiologia316(3): 199-210.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Growth	NR		T	4.79	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Growth	NR		T	7.63	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	NR	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	NR	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	10000	NR	NR	ug/L	LAB	1996. Lam, P.K.S.. Interpopulation Differences in Acute Response of Brotia hainanensis (Gastropoda, Prosobranchia) to Cadmium: Genetic or Environmental Variance?. Environ. Pollut.94(1): 1-7.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	200	NR	NR	ug/L	LAB	1995. Forbes, V.E., V. Moller, and M.H. Depledge. Intrapopulation Variability in Sublethal Response to Heavy Metal Stress in Sexual and Asexual Gastropod Populations. Funct. Ecol.9: 477-484.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC25	Not Reported	T	0.08	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC25	Not Reported	T	0.22	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2710	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	6350	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	93	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	93	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1090	NR	NR	ug/L	LAB	1996. Lam, P.K.S.. Interpopulation Differences in Acute Response of Brotia hainanensis (Gastropoda, Prosobranchia) to Cadmium: Genetic or Environmental Variance?. Environ. Pollut.94(1): 1-7.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1180	NR	NR	ug/L	LAB	1996. Lam, P.K.S.. Interpopulation Differences in Acute Response of Brotia hainanensis (Gastropoda, Prosobranchia) to Cadmium: Genetic or Environmental Variance?. Environ. Pollut.94(1): 1-7.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1220	NR	NR	ug/L	LAB	1996. Lam, P.K.S.. Interpopulation Differences in Acute Response of Brotia hainanensis (Gastropoda, Prosobranchia) to Cadmium: Genetic or Environmental Variance?. Environ. Pollut.94(1): 1-7.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	14500	NR	NR	ug/L	LAB	1996. Lam, P.K.S.. Sublethal Effects of Cadmium on the Energetics of a Tropical Freshwater Snail, Brotia hainanensis (Brot, 1872). Environ. Toxicol. Water Qual.11: 345-349.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	15210	NR	NR	ug/L	LAB	1996. Lam, P.K.S.. Interpopulation Differences in Acute Response of Brotia hainanensis (Gastropoda, Prosobranchia) to Cadmium: Genetic or Environmental Variance?. Environ. Pollut.94(1): 1-7.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	35940	NR	NR	ug/L	LAB	1996. Lam, P.K.S.. Interpopulation Differences in Acute Response of Brotia hainanensis (Gastropoda, Prosobranchia) to Cadmium: Genetic or Environmental Variance?. Environ. Pollut.94(1): 1-7.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	770	NR	NR	ug/L	LAB	1996. Lam, P.K.S.. Interpopulation Differences in Acute Response of Brotia hainanensis (Gastropoda, Prosobranchia) to Cadmium: Genetic or Environmental Variance?. Environ. Pollut.94(1): 1-7.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1550	NR	NR	ug/L	LAB	1983. Gadkari, A.S., and V.B. Marathe. Toxicity of Cadmium and Lead to a Fish and a Snail from Two Different Habitats. Indian Assoc. Water Pollut. Control Tech. Annu.5: 141-148.
Sulfuric acid, Cadmium salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	21875*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Sulfuric acid, Cadmium salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	10408*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Sulfuric acid, Cadmium salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3654*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Sulfuric acid, Cadmium salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2578*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Sulfuric acid, Cadmium salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1225*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Nitric acid, Cadmium salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	48930	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Cadmium salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Cadmium salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	9000	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Cadmium salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4800	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Cadmium salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1060	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Cadmium salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	570	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Cadmium salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2006. Schirling, M., A. Bohlen, R. Triebskorn, and H.R. Kohler. An Invertebrate Embryo Test with the Apple Snail Marisa cornuarietis to Assess Effects of Potential Developmental and Endocrine Disruptors. Chemosphere64(10): 1730-1738.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	LOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2006. Schirling, M., A. Bohlen, R. Triebskorn, and H.R. Kohler. An Invertebrate Embryo Test with the Apple Snail Marisa cornuarietis to Assess Effects of Potential Developmental and Endocrine Disruptors. Chemosphere64(10): 1730-1738.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	1.51	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	1.52	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	13.2	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	2.41	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	2.5	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	4.41	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	4.79	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	7.17	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	7.63	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2006. Schirling, M., A. Bohlen, R. Triebskorn, and H.R. Kohler. An Invertebrate Embryo Test with the Apple Snail Marisa cornuarietis to Assess Effects of Potential Developmental and Endocrine Disruptors. Chemosphere64(10): 1730-1738.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	12.9	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	30000	NR	NR	ug/L	LAB	1996. Lam, P.K.S.. Sublethal Effects of Cadmium on the Energetics of a Tropical Freshwater Snail, Brotia hainanensis (Brot, 1872). Environ. Toxicol. Water Qual.11: 345-349.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	55000	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	700	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Reproduction	LOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Dorgelo, J., H. Meester, and C. Van Velzen. Effects of Diet and Heavy Metals on Growth Rate and Fertility in the Deposit-Feeding Snail Potamopyrgus jenkinsi (Smith) (Gastropoda: Hydrobiidae). Hydrobiologia316(3): 199-210.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Reproduction	NR		T	2.5	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Reproduction	NR		T	4.41	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Reproduction	NR		T	4.79	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Snail	Molluscs	Fresh	Reproduction	NR		T	7.63	NA	NR	ug/L	LAB	1984. Holcombe, G.W., G.L. Phipps, and J.W. Marier. Methods for Conducting Snail (Aplexa hypnorum) Embryo Through Adult Exposures: Effects of Cadmium and Reduced pH Levels. Arch. Environ. Contam. Toxicol.13(5): 627-634.
Cadmium chloride (CdCl2)	Snipefly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	10000	NR	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Acute Cadmium Toxicity Studies upon Nine Species of Aquatic Insects. Environ. Res.9: 332-341.
Cadmium chloride (CdCl2)	Soil Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2500	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Cadmium chloride (CdCl2)	Soil Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Cadmium chloride (CdCl2)	Soil Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5000	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Cadmium chloride (CdCl2)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	38	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Cadmium chloride (CdCl2)	Southern Rainbow Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Cadmium	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	10100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	5100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	3800	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	8400	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Cadmium chloride (CdCl2)	Starfish	Invertebrates	Fresh	Reproduction	NR		T	25	NA	NR	ug/L	LAB	1989. Den Besten, P.J., H.J. Herwig, D.I. Zandee, and P.A. Voogt. Effects of Cadmium and PCBs on Reproduction of the Sea Star Asterias rubens: Aberrations in the Early Development. Ecotoxicol. Environ. Saf.18(2): 173-180.
Cadmium	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	85000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	85000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	26000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium chloride (CdCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1500000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	560000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1300000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	420000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	18000	NR	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Acute Cadmium Toxicity Studies upon Nine Species of Aquatic Insects. Environ. Res.9: 332-341.
Nitric acid, Cadmium salt	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	23298*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Cadmium chloride (CdCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	17500	NR	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Acute Cadmium Toxicity Studies upon Nine Species of Aquatic Insects. Environ. Res.9: 332-341.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	14000	NR	NR	ug/L	LAB	1975. Clubb, R.W., A.R. Gaufin, and J.L. Lords. Acute Cadmium Toxicity Studies upon Nine Species of Aquatic Insects. Environ. Res.9: 332-341.
Cadmium chloride (CdCl2)	Swan Mussel	Molluscs	Fresh	Growth	NR	ultiple Tissue/Orga	T	16	NA	NR	ug/L	LAB	1984. Balogh, K., and J. Salanki. The Dynamics of Mercury and Cadmium Uptake into Different Organs of Anodonta cygnea L. Water Res.18(11): 1381-1387.
Cadmium	Swan Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Pynnonen, K.. Effect of pH, Hardness and Maternal Pre-exposure on the Toxicity of Cd, Cu and Zn to the Glochidial Larvae of a Freshwater Clam Anodonta cygnea. Water Res.29(1): 247-254.
Cadmium	Swan Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Pynnonen, K.. Effect of pH, Hardness and Maternal Pre-exposure on the Toxicity of Cd, Cu and Zn to the Glochidial Larvae of a Freshwater Clam Anodonta cygnea. Water Res.29(1): 247-254.
Cadmium chloride (CdCl2)	Swan Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2006. Lopes-Lima, M., G. Moura, B. Pratoomchat, and J. Machado. Correlation Between the Morpho-Cytohistochemistry of the Outer Mantle Epithelium of Anodonta cygnea with Seasonal Variations and Following Pollutant Exposure. Mar. Freshw. Behav. Physiol.39(3): 235-243.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	74650		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	89600		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	91910		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	99860		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	28550		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	70020		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	78140		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	99860		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	28550		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	58590		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	66380		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	77780		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	28550		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	56000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	61470		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	NR		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	500	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	650	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	470	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	530	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	330	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	230	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	260	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	160	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	200	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	270	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	530	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	690	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	500	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	560	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	340	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	280	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	280	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	170	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	210	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	290	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	450	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	590	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	420	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	480	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	280	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	210	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	220	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	220	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	140	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	170	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	240	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	6500	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	9800	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	6.9	NA	NR	uM	LAB	1994. Chen, T., A. Furst, and P.K. Chien. The Effects of Cadmium and Iron on Catalase Activities in Tubifex. J. Am. Coll. Toxicol.13(2): 112-120.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	3090	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1620	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1240	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1350	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1390	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	3090	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	4890	NR	NR	ug/L	LAB	2009. Gerhardt, A.. Screening the Toxicity of Ni, Cd, Cu, Ivermectin, and Imidacloprid in a Short-Term Automated Behavioral Toxicity Test with Tubifex tubifex (Muller 1774) (Oligochaeta). Hum. Ecol. Risk Assess.15(1): 27-40.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	710	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	450000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	3600	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	6500	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	900	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	4.1	NA	NR	uM	LAB	1994. Chen, T., A. Furst, and P.K. Chien. The Effects of Cadmium and Iron on Catalase Activities in Tubifex. J. Am. Coll. Toxicol.13(2): 112-120.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1462	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	64	NR	NR	ug/L	LAB	2000. Bouche, M.L., F. Habets, S. Biagianti-Risbourg, and G. Vernet. Toxic Effects and Bioaccumulation of Cadmium in the Aquatic Oligochaete Tubifex tubifex. Ecotoxicol. Environ. Saf.46(3): 246-251.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	920	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1462	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	510	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	670	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	750	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	770	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	320000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	5400	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	46	NR	NR	ug/L	LAB	2000. Bouche, M.L., F. Habets, S. Biagianti-Risbourg, and G. Vernet. Toxic Effects and Bioaccumulation of Cadmium in the Aquatic Oligochaete Tubifex tubifex. Ecotoxicol. Environ. Saf.46(3): 246-251.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	560	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	340	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	380	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	420	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	580	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1032	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2000. Bouche, M.L., F. Habets, S. Biagianti-Risbourg, and G. Vernet. Toxic Effects and Bioaccumulation of Cadmium in the Aquatic Oligochaete Tubifex tubifex. Ecotoxicol. Environ. Saf.46(3): 246-251.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1032	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	390	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	3.7	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	63	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	77	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	2.8	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	45	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	720	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	2350	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	1960	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	1960	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	1960	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	980	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	1360	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	490	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	980	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	980	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	980	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	670	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	490	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	490	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	490	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	490	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	320	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	490	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	490	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	1360	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	490	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	980	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	980	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	980	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	670	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	490	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	490	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	490	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	320	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	170	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	120	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	120	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1980. Fischer, E., J. Filip, L. Molnar, and E. Nagy. Karyometric Studies of the Effect of Lead and Cadmium in Relation to the Oxygen Supply in the Chloragocytes of Tubifex tubifex Mull. Environ. Pollut. A.21(3): 203-207.
Cadmium	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	100000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	180000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1980. Fischer, E., J. Filip, L. Molnar, and E. Nagy. Karyometric Studies of the Effect of Lead and Cadmium in Relation to the Oxygen Supply in the Chloragocytes of Tubifex tubifex Mull. Environ. Pollut. A.21(3): 203-207.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	2000. Bouche, M.L., F. Habets, S. Biagianti-Risbourg, and G. Vernet. Toxic Effects and Bioaccumulation of Cadmium in the Aquatic Oligochaete Tubifex tubifex. Ecotoxicol. Environ. Saf.46(3): 246-251.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	10000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	32000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium chloride (CdCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	32000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cadmium	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	6400	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	6800	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	3500	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Sulfuric acid, Cadmium salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Sulfuric acid, Cadmium salt (1:1)	Turbellarian	Worms	Fresh	Growth	NR	Whole Organism	T	40	NR	NR	ug/L	LAB	1999. Indeherberg, M.B.M., N.M. Van Straalen, and E.R. Schockaert. Combining Life-History and Toxicokinetic Parameters to Interpret Differences in Sensitivity to Cadmium Between Populations of Polycelis tenuis (Platyhelminthes). Ecotoxicol. Environ. Saf.44(1): 1-11.
Cadmium	Turbellarian	Worms	Fresh	Mortality	LC50	Not Reported	T	130000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Turbellarian	Worms	Fresh	Mortality	LC50	Not Reported	T	270000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Turbellarian	Worms	Fresh	Mortality	LC50	Not Reported	T	100000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Turbellarian	Worms	Fresh	Mortality	LC50	Not Reported	T	125000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Turbellarian	Worms	Fresh	Mortality	LC50	Not Reported	T	74000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium	Turbellarian	Worms	Fresh	Mortality	LC50	Not Reported	T	80000	NA	NR	ug/L	LAB	1985. Williams, K.A., D.W.J. Green, and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 1. Cadmium. Arch. Hydrobiol.102(4): 461-471.
Cadmium chloride (CdCl2)	Turbellarian	Worms	Fresh	Mortality	LC50	Not Reported	T	44000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Turbellarian	Worms	Fresh	Mortality	LC50	Not Reported	T	36000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Turbellarian	Worms	Fresh	Mortality	LC50	Not Reported	T	29000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Sulfuric acid, Cadmium salt (1:1)	Turbellarian	Worms	Fresh	Mortality	LC50	Not Reported	T	4970	NR	NR	ug/L	LAB	1999. Indeherberg, M.B.M., N.M. Van Straalen, and E.R. Schockaert. Combining Life-History and Toxicokinetic Parameters to Interpret Differences in Sensitivity to Cadmium Between Populations of Polycelis tenuis (Platyhelminthes). Ecotoxicol. Environ. Saf.44(1): 1-11.
Sulfuric acid, Cadmium salt (1:1)	Turbellarian	Worms	Fresh	Mortality	LC50	Not Reported	T	4390	NR	NR	ug/L	LAB	1999. Indeherberg, M.B.M., N.M. Van Straalen, and E.R. Schockaert. Combining Life-History and Toxicokinetic Parameters to Interpret Differences in Sensitivity to Cadmium Between Populations of Polycelis tenuis (Platyhelminthes). Ecotoxicol. Environ. Saf.44(1): 1-11.
Sulfuric acid, Cadmium salt (1:1)	Turbellarian	Worms	Fresh	Reproduction	EC50	Not Reported	T	64	NR	NR	ug/L	LAB	1999. Indeherberg, M.B.M., N.M. Van Straalen, and E.R. Schockaert. Combining Life-History and Toxicokinetic Parameters to Interpret Differences in Sensitivity to Cadmium Between Populations of Polycelis tenuis (Platyhelminthes). Ecotoxicol. Environ. Saf.44(1): 1-11.
Sulfuric acid, Cadmium salt (1:1)	Turbellarian	Worms	Fresh	Reproduction	EC50	Not Reported	T	58	NR	NR	ug/L	LAB	1999. Indeherberg, M.B.M., N.M. Van Straalen, and E.R. Schockaert. Combining Life-History and Toxicokinetic Parameters to Interpret Differences in Sensitivity to Cadmium Between Populations of Polycelis tenuis (Platyhelminthes). Ecotoxicol. Environ. Saf.44(1): 1-11.
Sulfuric acid, Cadmium salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC25	Not Reported	T	1500	NR	NR	ug/L	LAB	1986. Hall, F., M. Morita, and J.B. Best. Neoplastic Transformation in the Planarian: 1. Cocarcinogenesis and Histopathology. J. Exp. Zool.240(2): 211-228.
Cadmium	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	2250	NA	NR	ug/L	LAB	1974. See, C.L., A.L.,Jr. Buikema, and J.,Jr. Cairns. The Effects of Selected Toxicants on Survival of Dugesia tigrina (Turbellaria). ASB (Assoc. Southeast. Biol.) Bull.21(2): 82.
Cadmium chloride (CdCl2)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	4900	NA	NR	ug/L	LAB	1978. Fennikoh, K.B., H.I. Hirshfield, and T.J. Kneip. Cadmium Toxicity in Planktonic Organisms of a Freshwater Food Web. Environ. Res.15(3): 357-367.
Sulfuric acid, Cadmium salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1986. Hall, F., M. Morita, and J.B. Best. Neoplastic Transformation in the Planarian: 1. Cocarcinogenesis and Histopathology. J. Exp. Zool.240(2): 211-228.
Sulfuric acid, Cadmium salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	23300	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..
Sulfuric acid, Cadmium salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	6750	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..
Sulfuric acid, Cadmium salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	7500	NA	NR	ug/L	LAB	1986. Hall, F., M. Morita, and J.B. Best. Neoplastic Transformation in the Planarian: 1. Cocarcinogenesis and Histopathology. J. Exp. Zool.240(2): 211-228.
Sulfuric acid, Cadmium salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	30000	NA	NR	ug/L	LAB	1986. Hall, F., M. Morita, and J.B. Best. Neoplastic Transformation in the Planarian: 1. Cocarcinogenesis and Histopathology. J. Exp. Zool.240(2): 211-228.
Sulfuric acid, Cadmium salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	15000	NA	NR	ug/L	LAB	1986. Hall, F., M. Morita, and J.B. Best. Neoplastic Transformation in the Planarian: 1. Cocarcinogenesis and Histopathology. J. Exp. Zool.240(2): 211-228.
Cadmium	Turbellarian, Planarian	Worms	Fresh	Mortality	LC50	Not Reported	T	23220	NA	NR	ug/L	LAB	1995. Ham, L., R. Quinn, and D. Pascoe. Effects of Cadmium on the Predator-Prey Interaction Between the Turbellarian Dendrocoelum lacteum (Muller, 1774) and the Isopod Crustacean Asellus. Arch. Environ. Contam. Toxicol.29(3): 358-365.
Cadmium chloride (CdCl2)	Turbellarian, Planarian	Worms	Fresh	Mortality	LC50	Not Reported	T	80000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Turbellarian, Planarian	Worms	Fresh	Mortality	LC50	Not Reported	T	46000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Water Bug	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	13000000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Water Bug	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5200000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Cadmium chloride (CdCl2)	Water Bug	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2400000	NA	NR	ug/L	LAB	1988. Brown, A.F., and D. Pascoe. Studies on the Acute Toxicity of Pollutants to Freshwater Macroinvertebrates. 5. The Acute toxicity of Cadmium to Twelve Species of Predatory. Arch. Hydrobiol.114(2): 311-319.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	EC10	Not Reported	T	1.65	NR	NR	ug/L	LAB	2000. Barata, C., and D.J. Baird. Determining the Ecotoxicological Mode of Action of Chemicals from Measurements Made on Individuals: Results from Instar-Based Tests with Daphnia magna Straus. Aquat. Toxicol.48(2-3): 195-209.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	EC50	Not Reported	T	1	NA	NR	ug/L	LAB	1995. De Coen, W.M., C.R. Janssen, and G. Persoone. Biochemical Assessment of Cellular Energy Allocation in Daphnia magna Exposed to Toxic Stress as an Alternative to the Conventional "Scope for Growth". In: Proc. of the International Symposium on Biological Markers of Pollution, Sept. 21-22, 1995, Chinon, France: 163-170.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	EC50	Not Reported	T	6.11	NR	NR	ug/L	LAB	2000. Barata, C., and D.J. Baird. Determining the Ecotoxicological Mode of Action of Chemicals from Measurements Made on Individuals: Results from Instar-Based Tests with Daphnia magna Straus. Aquat. Toxicol.48(2-3): 195-209.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	'2E-8	NR	NR	M	LAB	2005. Baillieul, M., R. Smolders, and R. Blust. The Effect of Environmental Stress on Absolute and Mass-Specific Scope for Growth in Daphnia magna Strauss. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.140(3-4): 364-373.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	'2E-8	NR	NR	M	LAB	2005. Baillieul, M., R. Smolders, and R. Blust. The Effect of Environmental Stress on Absolute and Mass-Specific Scope for Growth in Daphnia magna Strauss. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.140(3-4): 364-373.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Not Reported	T	2.3	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Not Reported	T	4	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Not Reported	T	4.4	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Not Reported	T	7	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Not Reported	T	23.3	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	'0.91E-8	NR	NR	M	LAB	2005. Baillieul, M., R. Smolders, and R. Blust. The Effect of Environmental Stress on Absolute and Mass-Specific Scope for Growth in Daphnia magna Strauss. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.140(3-4): 364-373.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	'0.91E-8	NR	NR	M	LAB	2005. Baillieul, M., R. Smolders, and R. Blust. The Effect of Environmental Stress on Absolute and Mass-Specific Scope for Growth in Daphnia magna Strauss. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.140(3-4): 364-373.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	5.5	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	10.2	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	1	NR	NR	ug/L	LAB	2000. Barata, C., and D.J. Baird. Determining the Ecotoxicological Mode of Action of Chemicals from Measurements Made on Individuals: Results from Instar-Based Tests with Daphnia magna Straus. Aquat. Toxicol.48(2-3): 195-209.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1990. Goerke, H., and K. Weber. Population-Dependent Elimination of Various Polychlorinated Biphenyls in Nereis diversicolor (Polychaeta). Mar. Environ. Res.29(3): 205-226.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	T	1	NA	NR	ug/L	LAB	1986. Dillon, T.M., and B.C. Suedel. The Relationship Between Cadmium Bioaccumulation and Survival, Growth, and Reproduction in the Freshwater Crustacean, Daphnia magna. In: Environ.Contam., 2nd Int.Conf., CEP Consultant, Edinburgh, U.K.: 21-23.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	T	0.5	NA	NR	ug/L	LAB	1986. Dillon, T.M., and B.C. Suedel. The Relationship Between Cadmium Bioaccumulation and Survival, Growth, and Reproduction in the Freshwater Crustacean, Daphnia magna. In: Environ.Contam., 2nd Int.Conf., CEP Consultant, Edinburgh, U.K.: 21-23.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Barber, I., D.J. Baird, and P. Calow. Effect of Cadmium and Ration Level on Oxygen Consumption, RNA Concentration and RNA-DNA Ratio in Two Clones of Daphnia magna Straus. Aquat. Toxicol.30(3): 249-258.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	T	0.5	NA	NR	ug/L	LAB	1986. Dillon, T.M., and B.C. Suedel. The Relationship Between Cadmium Bioaccumulation and Survival, Growth, and Reproduction in the Freshwater Crustacean, Daphnia magna. In: Environ.Contam., 2nd Int.Conf., CEP Consultant, Edinburgh, U.K.: 21-23.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	T	1	NA	NR	ug/L	LAB	1986. Dillon, T.M., and B.C. Suedel. The Relationship Between Cadmium Bioaccumulation and Survival, Growth, and Reproduction in the Freshwater Crustacean, Daphnia magna. In: Environ.Contam., 2nd Int.Conf., CEP Consultant, Edinburgh, U.K.: 21-23.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1998. Santojanni, A., G. Gorbi, and F. Sartore. Prediction of Fecundity in Chronic Toxicity Tests on Daphnia magna. Water Res.32(10): 3146-3156.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	L	NR	NR	NR	M	LAB	1999. Baillieul, M., and R. Blust. Analysis of the Swimming Velocity of Cadmium-Stressed Daphnia magna. Aquat. Toxicol.44: 245-254.
Cadmium	Water Flea	Crustaceans	Fresh	Growth	NR		T	0.32	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., W.J. Luttmer, and P.S. Griffioen. The Use of Cohorts and Populations in Chronic Toxicity Studies with Daphnia magna: A Cadmium Example. Ecotoxicol. Environ. Saf.9: 26-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NR		T	3.4	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NR		T	7.2	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDN	1997. Koivisto, S., M. Arner, and N. Kautsky. Does Cadmium Pollution Change Trophic Interactions in Rockpool Food Webs?. Environ. Toxicol. Chem.16(6): 1330-1336.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1989. Chandini, T.. Survival, Growth and Reproduction of Daphnia carinata (Crustacea: Cladocera) Exposed to Chronic Cadmium Stress at Different Food (Chlorella) Levels. Environ. Pollut.60(1): 29-45.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDN	1997. Koivisto, S., M. Arner, and N. Kautsky. Does Cadmium Pollution Change Trophic Interactions in Rockpool Food Webs?. Environ. Toxicol. Chem.16(6): 1330-1336.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Kluttgen, B., and H.T. Ratte. Effects of Different Food Doses on Cadmium Toxicity to Daphnia magna. Environ. Toxicol. Chem.13(10): 1619-1627.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1986. Berglind, R.. Combined and Separate Effects of Cadmium, Lead and Zinc on Ala-D Activity, Growth and Hemoglobin Content in Daphnia magna. Environ. Toxicol. Chem.5: 989-995.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	6	NA	NR	ug/L	LAB	1990. Baird, D.J., I. Barber, and P. Calow. Clonal Variation in General Responses of Daphnia magna Straus to Toxic Stress. I. Chronic Life-History Effects. Funct. Ecol.4(3): 399-407.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Baird, D.J., I. Barber, and P. Calow. Clonal Variation in General Responses of Daphnia magna Straus to Toxic Stress. I. Chronic Life-History Effects. Funct. Ecol.4(3): 399-407.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NR		T	1	NA	NR	ug/L	LAB	1988. Bodar, C.W.M., I. Van der Sluis, P.A. Voogt, and D.I. Zandee. Effects of Cadmium on Consumption, Assimilation and Biochemical Parameters of Daphnia magna: Possible Implications for Reproduction. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.90(2): 341-346.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Growth	NR		T	1.6	NA	NR	ug/L	LAB	1985. Berglind, R.. The Effects of Cadmium on ALA-D Activity, Growth and Haemoglobin Content in the Water Flea, Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.80(2): 407-410.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR		T	1	NA	NR	ug/L	LAB	1988. Winner, R.W.. Evaluation of the Relative Sensitivities of 7-D Daphnia magna and Ceriodaphnia dubia Toxicity Tests for Cadmium and Sodium Pentachlorophenate. Environ. Toxicol. Chem.7(2): 153-159.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR		T	2	NA	NR	ug/L	LAB	1988. Winner, R.W.. Evaluation of the Relative Sensitivities of 7-D Daphnia magna and Ceriodaphnia dubia Toxicity Tests for Cadmium and Sodium Pentachlorophenate. Environ. Toxicol. Chem.7(2): 153-159.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1982. Ingersoll, C.G., and R.W. Winner. Effect on Daphnia pulex (De Geer) of Daily Pulse Exposures to Copper or Cadmium. Environ. Toxicol. Chem.1: 321-327.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	54.2	NR	NR	ug/L	LAB	1995. Bitton, G., K. Rhodes, B. Koopman, and M. Cornejo. Short-Term Toxicity Assay Based on Daphnid Feeding Behavior. Water Environ. Res.67(3): 290-293.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	55.9	NR	NR	ug/L	LAB	1997. Lee, S.I., E.J. Na, Y.O. Cho, B. Koopman, and G. Bitton. Short-Term Toxicity Test Based on the Algal Uptake by Ceriodaphnia dubia. Water Environ. Res.69: 1207-1210.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	0.2	NR	NR	ng/d	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	4.2	NR	NR	g/g dry f	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	10.6	NR	NR	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	9.5	NA	NR	ug/L	LAB	1996. Guilhermino, L., M.C. Lopes, A.P. Carvalho, and A.M.V.M. Soares. Inhibition of Acetylcholinesterase Activity as Effect Criterion in Acute Tests with Juvenile Daphnia magna. Chemosphere32(4): 727-738.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	A	5.44	NR	NR	ug/L	LAB	2006. Barata, C., D.J. Baird, A.J.A. Nogueira, A.M.V.M. Soares, and M.C. Riva. Toxicity of Binary Mixtures of Metals and Pyrethroid Insecticides to Daphnia magna Straus. Implications for Multi-Substance Risks Assessment. Aquat. Toxicol.78(1): 1-14.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	104.4	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	0.5	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	150	NR	NR	ug/L	LAB	2005. Tsui, M.T.K., W.X. Wang, and L.M. Chu. Influence of Glyphosate and Its Formulation (Roundup) on the Toxicity and Bioavailability of Metals to Ceriodaphnia dubia. Environ. Pollut.138(1): 59-68.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	5000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	1000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	250	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	1000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	125	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	25	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC15	Not Reported	T	0.15	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC15	Not Reported	T	0.05	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC15	Not Reported	T	0.27	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC15	Not Reported	T	0.33	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2325	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1585	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	618.6	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	83	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., W.J. Luttmer, and P.S. Griffioen. The Use of Cohorts and Populations in Chronic Toxicity Studies with Daphnia magna: A Cadmium Example. Ecotoxicol. Environ. Saf.9: 26-39.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24	NA	NR	ug/L	LAB	1984. Schuytema, G.S., P.O. Nelson, K.W. Malueg, A.V. Nebeker, D.F. Krawczyk, and A.K. Ratcliff. Toxicity of Cadmium in Water and Sediment Slurries to Daphnia magna. Environ. Toxicol. Chem.3(2): 293-308.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NA	NR	ug/L	LAB	1984. Schuytema, G.S., P.O. Nelson, K.W. Malueg, A.V. Nebeker, D.F. Krawczyk, and A.K. Ratcliff. Toxicity of Cadmium in Water and Sediment Slurries to Daphnia magna. Environ. Toxicol. Chem.3(2): 293-308.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1984. Schuytema, G.S., P.O. Nelson, K.W. Malueg, A.V. Nebeker, D.F. Krawczyk, and A.K. Ratcliff. Toxicity of Cadmium in Water and Sediment Slurries to Daphnia magna. Environ. Toxicol. Chem.3(2): 293-308.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	118	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36	NA	NR	ug/L	LAB	1984. Schuytema, G.S., P.O. Nelson, K.W. Malueg, A.V. Nebeker, D.F. Krawczyk, and A.K. Ratcliff. Toxicity of Cadmium in Water and Sediment Slurries to Daphnia magna. Environ. Toxicol. Chem.3(2): 293-308.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	62	NA	NR	ug/L	LAB	1984. Schuytema, G.S., P.O. Nelson, K.W. Malueg, A.V. Nebeker, D.F. Krawczyk, and A.K. Ratcliff. Toxicity of Cadmium in Water and Sediment Slurries to Daphnia magna. Environ. Toxicol. Chem.3(2): 293-308.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., W.J. Luttmer, and P.S. Griffioen. The Use of Cohorts and Populations in Chronic Toxicity Studies with Daphnia magna: A Cadmium Example. Ecotoxicol. Environ. Saf.9: 26-39.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	68	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.78	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.87	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.96	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.6	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.1	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	54.5	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.28	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.44	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.97	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	63.1	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16.9	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.6	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.9	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19.05	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.2	NR	NR	ng/d	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.4	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	129	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200		NC	ug/L	LAB	2007. Mohammed, A.. Comparative Sensitivities of the Tropical Cladoceran, Ceriodaphnia rigaudii and the Temperate Species Daphnia magna to Seven Toxicants. Toxicol. Environ. Chem.89(2): 347-352.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	2006. Mohammed, A., and J.B.R. Agard. Comparative Sensitivity of Three Tropical Cladoceran Species (Diaphanosoma brachyurum, Ceriodaphnia rigaudii and Moinodaphnia macleayi) to Six Chemicals. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control41(12): 2713-2720.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.09	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	265	NA	NR	ug/L	LAB	1988. Chandini, T.. Changes in Food [Chlorella] Levels and the Acute Toxicity of Cadmium to Daphnia carinata (Daphnidae) and Echinisca triserialis (Macrothricidae)(Crustacea: Cladocera). Bull. Environ. Contam. Toxicol.41(3): 398-403.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1988. Chandini, T.. Changes in Food [Chlorella] Levels and the Acute Toxicity of Cadmium to Daphnia carinata (Daphnidae) and Echinisca triserialis (Macrothricidae)(Crustacea: Cladocera). Bull. Environ. Contam. Toxicol.41(3): 398-403.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	509	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1988. Chandini, T.. Changes in Food [Chlorella] Levels and the Acute Toxicity of Cadmium to Daphnia carinata (Daphnidae) and Echinisca triserialis (Macrothricidae)(Crustacea: Cladocera). Bull. Environ. Contam. Toxicol.41(3): 398-403.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	235	NA	NR	ug/L	LAB	1988. Chandini, T.. Changes in Food [Chlorella] Levels and the Acute Toxicity of Cadmium to Daphnia carinata (Daphnidae) and Echinisca triserialis (Macrothricidae)(Crustacea: Cladocera). Bull. Environ. Contam. Toxicol.41(3): 398-403.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	480	NA	NR	ug/L	LAB	1988. Chandini, T.. Changes in Food [Chlorella] Levels and the Acute Toxicity of Cadmium to Daphnia carinata (Daphnidae) and Echinisca triserialis (Macrothricidae)(Crustacea: Cladocera). Bull. Environ. Contam. Toxicol.41(3): 398-403.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	8		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	520		NC	ug/L	LAB	2007. Mohammed, A.. Comparative Sensitivities of the Tropical Cladoceran, Ceriodaphnia rigaudii and the Temperate Species Daphnia magna to Seven Toxicants. Toxicol. Environ. Chem.89(2): 347-352.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	71	NR	NR	ug/L	LAB	2000. Guilhermino, L., T. Diamantino, M.C. Silva, and A.M.V.M. Soares. Acute Toxicity Test with Daphnia magna: An Alternative to Mammals in the Prescreening of Chemical Toxicity?. Ecotoxicol. Environ. Saf.46(3): 357-362.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	562	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1994. Domal-Kwiatkowska, D., B. Sosak-Swiderska, U. Mazurek, and D. Tyrawska. The Effect of Cadmium on the Survival and Filtering Rate of Daphnia magna, Straus 1820. Pol. Arch. Hydrobiol.41(4): 465-473.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	519	NA	NR	ug/L	LAB	1990. Bodar, C.W.M., I. Van der Sluis, J.C.P. Van Montfort, P.A. Voogt, and D.I. Zandee. Cadmium Resistance in Daphnia magna. Aquat. Toxicol.16(1): 33-40.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	107	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	108	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	151	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	191	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	216	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	218	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	25	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	55	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	586	NA	NR	ug/L	LAB	1990. Bodar, C.W.M., I. Van der Sluis, J.C.P. Van Montfort, P.A. Voogt, and D.I. Zandee. Cadmium Resistance in Daphnia magna. Aquat. Toxicol.16(1): 33-40.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	606	NA	NR	ug/L	LAB	1990. Bodar, C.W.M., I. Van der Sluis, J.C.P. Van Montfort, P.A. Voogt, and D.I. Zandee. Cadmium Resistance in Daphnia magna. Aquat. Toxicol.16(1): 33-40.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	61	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	75	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	78	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	83	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	92	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	92	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	92	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	203.8	NA	NR	ug/L	LAB	1982. Attar, E.N., and E.J. Maly. Acute Toxicity of Cadmium, Zinc, and Cadmium-Zinc Mixtures to Daphnia magna. Arch. Environ. Contam. Toxicol.11(3): 291-296.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.6	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58.16	NA	NR	ug/L	LAB	1982. Attar, E.N., and E.J. Maly. Acute Toxicity of Cadmium, Zinc, and Cadmium-Zinc Mixtures to Daphnia magna. Arch. Environ. Contam. Toxicol.11(3): 291-296.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17	NR	NR	ug/L	LAB	2000. Guilhermino, L., T. Diamantino, M.C. Silva, and A.M.V.M. Soares. Acute Toxicity Test with Daphnia magna: An Alternative to Mammals in the Prescreening of Chemical Toxicity?. Ecotoxicol. Environ. Saf.46(3): 357-362.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1999. Sankaramanachi, S.K., and S.R. Qasim. Metal Toxicity Evaluation Using Bioassay and Microtox. Int. J. Environ. Stud.56(2): 187-199.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1995. Allen, Y., P. Calow, and D.J. Baird. A Mechanistic Model of Contaminant-Induced Feeding Inhibition in Daphnia magna. Environ. Toxicol. Chem.14(9): 1625-1630.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	78	L	60	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	8	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	122	L	77	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24	L	18	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	252	D	61	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	L	25	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36	L	28	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	L	31	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	69	D	27	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	144	NA	NR	ug/L	LAB	1984. Schuytema, G.S., P.O. Nelson, K.W. Malueg, A.V. Nebeker, D.F. Krawczyk, and A.K. Ratcliff. Toxicity of Cadmium in Water and Sediment Slurries to Daphnia magna. Environ. Toxicol. Chem.3(2): 293-308.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	39	NA	NR	ug/L	LAB	1984. Schuytema, G.S., P.O. Nelson, K.W. Malueg, A.V. Nebeker, D.F. Krawczyk, and A.K. Ratcliff. Toxicity of Cadmium in Water and Sediment Slurries to Daphnia magna. Environ. Toxicol. Chem.3(2): 293-308.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	44	NA	NR	ug/L	LAB	1984. Schuytema, G.S., P.O. Nelson, K.W. Malueg, A.V. Nebeker, D.F. Krawczyk, and A.K. Ratcliff. Toxicity of Cadmium in Water and Sediment Slurries to Daphnia magna. Environ. Toxicol. Chem.3(2): 293-308.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	97	NA	NR	ug/L	LAB	1984. Schuytema, G.S., P.O. Nelson, K.W. Malueg, A.V. Nebeker, D.F. Krawczyk, and A.K. Ratcliff. Toxicity of Cadmium in Water and Sediment Slurries to Daphnia magna. Environ. Toxicol. Chem.3(2): 293-308.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	166	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	34	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	49	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	63	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.9	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	3	NR	NR	ug/L	LAB	2006. Yim, J.H., K.W. Kim, and S.D. Kim. Effect of Hardness on Acute Toxicity of Metal Mixtures Using Daphnia magna: Prediction of Acid Mine Drainage Toxicity. J. Hazard. Mater.B138(1): 16-21.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	4	NR	NR	ug/L	LAB	2006. Yim, J.H., K.W. Kim, and S.D. Kim. Effect of Hardness on Acute Toxicity of Metal Mixtures Using Daphnia magna: Prediction of Acid Mine Drainage Toxicity. J. Hazard. Mater.B138(1): 16-21.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.9	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	104.9	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	22600	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66	NR	NR	ug/L	LAB	1999. Baer, K.N., M.C. Ziegenfuss, S.D. Banks, and Z. Ling. Suitability of high-Hardness COMBO Medium Ecotoxicity Testing Using Algae, Daphnids and Fish. Bull. Environ. Contam. Toxicol.63(3): 289-296.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66.8	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	69	NR	NR	ug/L	LAB	1999. Baer, K.N., M.C. Ziegenfuss, S.D. Banks, and Z. Ling. Suitability of high-Hardness COMBO Medium Ecotoxicity Testing Using Algae, Daphnids and Fish. Bull. Environ. Contam. Toxicol.63(3): 289-296.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	79.05	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.2	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	90.1	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	97.8	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	98	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Penttinen, S., A. Kostamo, and J.V.K. Kukkonen. Combined Effects of Dissolved Organic Material and Water Hardness on Toxicity of Cadmium to Daphnia magna. Environ. Toxicol. Chem.17(12): 2498-2503.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	22.4	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26.4	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28.6	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1994. Domal-Kwiatkowska, D., B. Sosak-Swiderska, U. Mazurek, and D. Tyrawska. The Effect of Cadmium on the Survival and Filtering Rate of Daphnia magna, Straus 1820. Pol. Arch. Hydrobiol.41(4): 465-473.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	263	NA	NR	ug/L	LAB	1990. Bodar, C.W.M., I. Van der Sluis, J.C.P. Van Montfort, P.A. Voogt, and D.I. Zandee. Cadmium Resistance in Daphnia magna. Aquat. Toxicol.16(1): 33-40.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	294	NA	NR	ug/L	LAB	1990. Enserink, L., W. Luttmer, and H. Maas-Diepeveen. Reproductive Strategy of Daphnia magna Affects the Sensitivity of Its Progeny in Acute Toxicity Tests. Aquat. Toxicol.17(1): 15-26.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	304	NA	NR	ug/L	LAB	1990. Bodar, C.W.M., I. Van der Sluis, J.C.P. Van Montfort, P.A. Voogt, and D.I. Zandee. Cadmium Resistance in Daphnia magna. Aquat. Toxicol.16(1): 33-40.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1990. Bodar, C.W.M., I. Van der Sluis, J.C.P. Van Montfort, P.A. Voogt, and D.I. Zandee. Cadmium Resistance in Daphnia magna. Aquat. Toxicol.16(1): 33-40.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	43	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	43	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	43	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	49	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	49	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	56	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.1	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	61	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	61	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	74	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	98	NA	NR	ug/L	LAB	1990. Enserink, L., W. Luttmer, and H. Maas-Diepeveen. Reproductive Strategy of Daphnia magna Affects the Sensitivity of Its Progeny in Acute Toxicity Tests. Aquat. Toxicol.17(1): 15-26.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	98	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	98	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	106	NA	NR	ug/L	LAB	1984. Schuytema, G.S., P.O. Nelson, K.W. Malueg, A.V. Nebeker, D.F. Krawczyk, and A.K. Ratcliff. Toxicity of Cadmium in Water and Sediment Slurries to Daphnia magna. Environ. Toxicol. Chem.3(2): 293-308.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	117	NA	NR	ug/L	LAB	1984. Schuytema, G.S., P.O. Nelson, K.W. Malueg, A.V. Nebeker, D.F. Krawczyk, and A.K. Ratcliff. Toxicity of Cadmium in Water and Sediment Slurries to Daphnia magna. Environ. Toxicol. Chem.3(2): 293-308.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15.81	NA	NR	ug/L	LAB	1982. Attar, E.N., and E.J. Maly. Acute Toxicity of Cadmium, Zinc, and Cadmium-Zinc Mixtures to Daphnia magna. Arch. Environ. Contam. Toxicol.11(3): 291-296.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	670	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.3	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.5	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.9	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.4	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.4	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.3	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1988. Bodar, C.W.M., C.J. Van Leeuwen, P.A. Voogt, and D.I. Zandee. Effect of Cadmium on the Reproduction Strategy of Daphnia magna. Aquat. Toxicol.12(4): 301-310.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.88	NA	NR	ug/L	LAB	1982. Attar, E.N., and E.J. Maly. Acute Toxicity of Cadmium, Zinc, and Cadmium-Zinc Mixtures to Daphnia magna. Arch. Environ. Contam. Toxicol.11(3): 291-296.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1982. Attar, E.N., and E.J. Maly. Acute Toxicity of Cadmium, Zinc, and Cadmium-Zinc Mixtures to Daphnia magna. Arch. Environ. Contam. Toxicol.11(3): 291-296.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 74 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	51	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 74 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12.7	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1994. Domal-Kwiatkowska, D., B. Sosak-Swiderska, U. Mazurek, and D. Tyrawska. The Effect of Cadmium on the Survival and Filtering Rate of Daphnia magna, Straus 1820. Pol. Arch. Hydrobiol.41(4): 465-473.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1980. Griffiths, P.R.E.. Morphological and Ultrastructural Effects of Sublethal Cadmium Poisoning on Daphnia. Environ. Res.22(2): 277-284.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.9	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	179.9	NA	NR	ug/L	LAB	1988. Stackhouse, R.A., and W.H. Benson. The Influence of Humic Acid on the Toxicity and Bioavailability of Selected Trace Metals. Aquat. Toxicol.13(2): 99-108.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1040	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	106	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	112	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	143	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	187	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	206	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	370	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	420	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	430	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	440	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	440	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	45	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	480	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	480	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	550	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	59	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	62	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	91	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	91	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	94	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.4	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	62	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70.1	NA	NR	ug/L	LAB	1988. Stackhouse, R.A., and W.H. Benson. The Influence of Humic Acid on the Toxicity and Bioavailability of Selected Trace Metals. Aquat. Toxicol.13(2): 99-108.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	87.881	NA	NR	ug/L	LAB	1990. Jindal, R., and A. Verma. Heavy Metal Toxicity to Daphnia pulex. Indian J. Environ. Health32(3): 289-292.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.4	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66	NA	NR	ug/L	LAB	1993. Roux, D.J., P.L. Kempster, E. Truter, and L. Van der Merwe. Effect of Cadmium and Copper on Survival and Reproduction of Daphnia pulex. Water SA19(4): 269-274.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1993. Roux, D.J., P.L. Kempster, E. Truter, and L. Van der Merwe. Effect of Cadmium and Copper on Survival and Reproduction of Daphnia pulex. Water SA19(4): 269-274.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	71	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	99	NA	NR	ug/L	LAB	1993. Roux, D.J., P.L. Kempster, E. Truter, and L. Van der Merwe. Effect of Cadmium and Copper on Survival and Reproduction of Daphnia pulex. Water SA19(4): 269-274.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1985. Lewis, P.A., and C.I. Weber. A Study of the Reliability of Daphnia Acute Toxicity Tests. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment, 7th Symposium, ASTM STP 854, Philadelphia, PA: 73-86.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	41	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	57	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	65	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1991. Lewis, P.A., and W.B. Horning II. Differences in Acute Toxicity Test Results of Three Reference Toxicants on Daphnia at Two Temperatures. Environ. Toxicol. Chem.10: 1351-1357.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5.2	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Roux, D.J., P.L. Kempster, E. Truter, and L. Van der Merwe. Effect of Cadmium and Copper on Survival and Reproduction of Daphnia pulex. Water SA19(4): 269-274.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46.3	NA	NR	ug/L	LAB	1988. Stackhouse, R.A., and W.H. Benson. The Influence of Humic Acid on the Toxicity and Bioavailability of Selected Trace Metals. Aquat. Toxicol.13(2): 99-108.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	62	NA	NR	ug/L	LAB	1979. Bertram, P.E., and B.A. Hart. Longevity and Reproduction of Daphnia pulex (Degeer) Exposed to Cadmium-Contaminated Food or Water. Environ. Pollut.19(4): 295-306.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32.4	NA	NR	ug/L	LAB	1988. Stackhouse, R.A., and W.H. Benson. The Influence of Humic Acid on the Toxicity and Bioavailability of Selected Trace Metals. Aquat. Toxicol.13(2): 99-108.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47	NA	NR	ug/L	LAB	1979. Bertram, P.E., and B.A. Hart. Longevity and Reproduction of Daphnia pulex (Degeer) Exposed to Cadmium-Contaminated Food or Water. Environ. Pollut.19(4): 295-306.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1060	NR	NR	ug/L	LAB	2006. Mohammed, A., and J.B.R. Agard. Comparative Sensitivity of Three Tropical Cladoceran Species (Diaphanosoma brachyurum, Ceriodaphnia rigaudii and Moinodaphnia macleayi) to Six Chemicals. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control41(12): 2713-2720.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	27.55	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32.58	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38.25	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	42.32	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	84.02	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15.27	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17.43	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	25.04	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29.13	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33.1	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5.26	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.68	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13.46	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20.98	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	22.21	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29.04	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	68.88	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.48	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.45	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.52	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.57	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	71.4	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80.4	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	42	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. Effects of Cadmium on the Periodicity of Parturition and Brood Size of Moina macrocopa (Cladocera). Environ. Pollut. A.26: 111-120.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	76	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. Effects of Cadmium on the Periodicity of Parturition and Brood Size of Moina macrocopa (Cladocera). Environ. Pollut. A.26: 111-120.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	83	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. Effects of Cadmium on the Periodicity of Parturition and Brood Size of Moina macrocopa (Cladocera). Environ. Pollut. A.26: 111-120.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	84	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. Effects of Cadmium on the Periodicity of Parturition and Brood Size of Moina macrocopa (Cladocera). Environ. Pollut. A.26: 111-120.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. Effects of Cadmium on the Periodicity of Parturition and Brood Size of Moina macrocopa (Cladocera). Environ. Pollut. A.26: 111-120.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	27	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. Effects of Cadmium on the Periodicity of Parturition and Brood Size of Moina macrocopa (Cladocera). Environ. Pollut. A.26: 111-120.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. Effects of Cadmium on the Periodicity of Parturition and Brood Size of Moina macrocopa (Cladocera). Environ. Pollut. A.26: 111-120.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. Effects of Cadmium on the Periodicity of Parturition and Brood Size of Moina macrocopa (Cladocera). Environ. Pollut. A.26: 111-120.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	650	NR	NR	ug/L	LAB	2006. Mohammed, A., and J.B.R. Agard. Comparative Sensitivity of Three Tropical Cladoceran Species (Diaphanosoma brachyurum, Ceriodaphnia rigaudii and Moinodaphnia macleayi) to Six Chemicals. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control41(12): 2713-2720.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	123	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24.5	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	89.3	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1900	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	820	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	280	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	62	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	55	NA	NR	ug/L	LAB	1974. Baudouin, M.F., and P. Scoppa. Acute Toxicity of Various Metals to Freshwater Zooplankton. Bull. Environ. Contam. Toxicol.12(6): 745-751.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	180		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	27		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.34	NR	NR	ug/L	LAB	2000. Barata, C., and D.J. Baird. Determining the Ecotoxicological Mode of Action of Chemicals from Measurements Made on Individuals: Results from Instar-Based Tests with Daphnia magna Straus. Aquat. Toxicol.48(2-3): 195-209.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.47	NR	NR	ug/L	LAB	2000. Barata, C., and D.J. Baird. Determining the Ecotoxicological Mode of Action of Chemicals from Measurements Made on Individuals: Results from Instar-Based Tests with Daphnia magna Straus. Aquat. Toxicol.48(2-3): 195-209.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	101	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	156	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	163	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2450	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47.7	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	739	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	890	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	943	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	309	NA	NR	ug/L	LAB	1981. Dave, G., K. Andersson, R. Berglind, and B. Hasselrot. Toxicity of Eight Solvent Extraction Chemicals and of Cadmium to Water Fleas, Daphnia magna, Rainbow Trout, Salmo gairdneri, and Zebrafish, Brachydanio rerio. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.69(1): 83-98.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5300	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.26	NR	NR	ug/L	LAB	2005. Barata, C., I. Varo, J.C. Navarro, S. Arun, and C. Porte. Antioxidant Enzyme Activities and Lipid Peroxidation in the Freshwater Cladoceran Daphnia magna Exposed to Redox Cycling Compounds. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.140(2): 175-186.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	27	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	106	L	91.4	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	112	L	104	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23.4	L	20.2	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23.6	L	18.1	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	233	L	179	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30.1	L	27.8	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3830	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	69	NA	NR	ug/L	LAB	1981. Dave, G., K. Andersson, R. Berglind, and B. Hasselrot. Toxicity of Eight Solvent Extraction Chemicals and of Cadmium to Water Fleas, Daphnia magna, Rainbow Trout, Salmo gairdneri, and Zebrafish, Brachydanio rerio. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.69(1): 83-98.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	99	NA	NR	ug/L	LAB	1992. Oikari, A., J. Kukkonen, and V. Virtanen. Acute Toxicity of Chemicals to Daphnia magna in Humic Waters. Sci. Total Environ.117-118: 367-377.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.17	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	187.5	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.41	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	223.8	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	224	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	479	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14.3	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15.2	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16.8	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17.1	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1981. Dave, G., K. Andersson, R. Berglind, and B. Hasselrot. Toxicity of Eight Solvent Extraction Chemicals and of Cadmium to Water Fleas, Daphnia magna, Rainbow Trout, Salmo gairdneri, and Zebrafish, Brachydanio rerio. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.69(1): 83-98.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80.4	NA	NR	ug/L	LAB	1984. Winner, R.W.. The Toxicity and Bioaccumulation of Cadmium and Copper as Affected by Humic Acid. Aquat. Toxicol.5(3): 267-274.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	89.7	NA	NR	ug/L	LAB	1984. Winner, R.W.. The Toxicity and Bioaccumulation of Cadmium and Copper as Affected by Humic Acid. Aquat. Toxicol.5(3): 267-274.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	93.2	NA	NR	ug/L	LAB	1984. Winner, R.W.. The Toxicity and Bioaccumulation of Cadmium and Copper as Affected by Humic Acid. Aquat. Toxicol.5(3): 267-274.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	96.2	NA	NR	ug/L	LAB	1984. Flickinger, A.L.. Chronic Toxicity of Mixtures of Copper, Cadmium and Zinc to Daphnia pulex. Ph.D.Thesis, Miami University, Oxford, OH: 135 p..
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	72.5	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	132	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	27300	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	78.2	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	104.3*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	90.1*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17.1*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20.4*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21.3*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	22.8*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	25.1*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26.5*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46	NR	NR	ug/L	LAB	1979. Kuhn, R., and J.H. Canton. Comparative Hydrobiological-Toxicological Results in Micro- and Macroorganisms of Biological Spectra (Vergleichende Hydrobiologisch-Toxikologische Befunde an Mikro- und Makroorganismen Biologischer Spektren). In: K.Aurand and J.Spaander (Eds.), Reinhaltung des Wassers, Verlag, Berlin, GER: 58-68.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66.4*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	71.1*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14.3	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19.06	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	218	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12	NA	NR	ug/L	LAB	1977. Giesy, J.P.,Jr., G.J. Leversee, and D.R. Williams. Effects of Naturally Occuring Aquatic Organic Fractions of Cadmium Toxicity to Simocephalus serrulatus (Daphnidae) and Gambusia affinis (Poeciliidae). Water Res.11(11): 1013-1020.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16.5	NA	NR	ug/L	LAB	1977. Giesy, J.P.,Jr., G.J. Leversee, and D.R. Williams. Effects of Naturally Occuring Aquatic Organic Fractions of Cadmium Toxicity to Simocephalus serrulatus (Daphnidae) and Gambusia affinis (Poeciliidae). Water Res.11(11): 1013-1020.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.5	NA	NR	ug/L	LAB	1977. Giesy, J.P.,Jr., G.J. Leversee, and D.R. Williams. Effects of Naturally Occuring Aquatic Organic Fractions of Cadmium Toxicity to Simocephalus serrulatus (Daphnidae) and Gambusia affinis (Poeciliidae). Water Res.11(11): 1013-1020.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35	NA	NR	ug/L	LAB	1977. Giesy, J.P.,Jr., G.J. Leversee, and D.R. Williams. Effects of Naturally Occuring Aquatic Organic Fractions of Cadmium Toxicity to Simocephalus serrulatus (Daphnidae) and Gambusia affinis (Poeciliidae). Water Res.11(11): 1013-1020.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1977. Giesy, J.P.,Jr., G.J. Leversee, and D.R. Williams. Effects of Naturally Occuring Aquatic Organic Fractions of Cadmium Toxicity to Simocephalus serrulatus (Daphnidae) and Gambusia affinis (Poeciliidae). Water Res.11(11): 1013-1020.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.6	NA	NR	ug/L	LAB	1977. Giesy, J.P.,Jr., G.J. Leversee, and D.R. Williams. Effects of Naturally Occuring Aquatic Organic Fractions of Cadmium Toxicity to Simocephalus serrulatus (Daphnidae) and Gambusia affinis (Poeciliidae). Water Res.11(11): 1013-1020.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	910	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	770	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	620	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	550	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	460	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	720	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	620	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	520	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	470	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	370	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	101	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	156	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	163	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	2450	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	47.7	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	739	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	890	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	943	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	0.1	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	10.17	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	12	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	187.5	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	2.41	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	223.8	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	224	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	479	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	NR	Mortality	LC50*	Not Reported	T	62*	NA	NR	ug/L	LAB	1970. Sporn, A., I. Dinu, L. Stoenescu, A. Cirstea, and L.G. Ghizelea. Acute and Subacute Toxicity of Cadmium (Toxicitatea Acuta Si Subacuta a Cadmiului). Igiena (Buchar.)19(4): 201-208.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC85	Not Reported	T	0.49	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC85	Not Reported	T	0.15	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC85	Not Reported	T	2.99	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC85	Not Reported	T	0.48	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	125	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	500	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	0.25	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	2500	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	5000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	0.5	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	25	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	100000	NR	NR	ug/L	LAB	1960. Bringmann, G., and R. Kuhn. The Water-Toxicological Detection of Insecticides (Zum Wasser-Toxikologischen Nachweis von Insektiziden). Gesund. -Ing.8: 243-244.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	101	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	156	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	163	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	2.41	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	2450	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	47.7	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	739	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	890	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	943	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	0.1	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	10.17	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	12	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	187.5	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	223.8	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	224	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	479	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	39	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	41	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	13	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	13	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	13	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	12.2	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	21.9	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	3.1	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	11.3	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	11.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	2.3	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	4.4	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	7	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	10.2	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	10.2	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	450	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	45	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Poynton, H.C., A.V. Loguinov, J.R. Varshavsky, S. Chan, E.J. Perkins, and C.D. Vulpe. Gene Expression Profiling in Daphnia magna. Part I: Concentration-Dependent Profiles Provide Support for the No Observed Transcriptional Effect Level. Environ. Sci. Technol.42(16): 6250-6256.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	1.5	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	45	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	7.5	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	80	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	80	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	20	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	20	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	80	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	25	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	0.75	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	25	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	19	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	19	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	10.7	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	9.6	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	NR	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	8.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	8	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	39	NR	NR	ug/L	LAB	1999. Baer, K.N., M.C. Ziegenfuss, S.D. Banks, and Z. Ling. Suitability of high-Hardness COMBO Medium Ecotoxicity Testing Using Algae, Daphnids and Fish. Bull. Environ. Contam. Toxicol.63(3): 289-296.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1999. Baer, K.N., M.C. Ziegenfuss, S.D. Banks, and Z. Ling. Suitability of high-Hardness COMBO Medium Ecotoxicity Testing Using Algae, Daphnids and Fish. Bull. Environ. Contam. Toxicol.63(3): 289-296.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5.5	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5.5	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	100		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2008. Poynton, H.C., A.V. Loguinov, J.R. Varshavsky, S. Chan, E.J. Perkins, and C.D. Vulpe. Gene Expression Profiling in Daphnia magna. Part I: Concentration-Dependent Profiles Provide Support for the No Observed Transcriptional Effect Level. Environ. Sci. Technol.42(16): 6250-6256.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1990. Goerke, H., and K. Weber. Population-Dependent Elimination of Various Polychlorinated Biphenyls in Nereis diversicolor (Polychaeta). Mar. Environ. Res.29(3): 205-226.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1	NA	NR	ug/L	LAB	1986. Dillon, T.M., and B.C. Suedel. The Relationship Between Cadmium Bioaccumulation and Survival, Growth, and Reproduction in the Freshwater Crustacean, Daphnia magna. In: Environ.Contam., 2nd Int.Conf., CEP Consultant, Edinburgh, U.K.: 21-23.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	L	NR	NR	NR	M	LAB	1999. Baillieul, M., and R. Blust. Analysis of the Swimming Velocity of Cadmium-Stressed Daphnia magna. Aquat. Toxicol.44: 245-254.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	22.9	NA	NR	ug/L	LAB	1989. Borgmann, U., K.M. Ralph, and W.P. Norwood. Toxicity Test Procedures for Hyalella azteca, and Chronic Toxicity of Cadmium and Pentachlorophenol to H. azteca, Gammarus fasciatus, and Daphnia magna. Arch. Environ. Contam. Toxicol.18(5): 756-764.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	7.78	NA	NR	ug/L	LAB	1989. Borgmann, U., K.M. Ralph, and W.P. Norwood. Toxicity Test Procedures for Hyalella azteca, and Chronic Toxicity of Cadmium and Pentachlorophenol to H. azteca, Gammarus fasciatus, and Daphnia magna. Arch. Environ. Contam. Toxicol.18(5): 756-764.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., W.J. Luttmer, and P.S. Griffioen. The Use of Cohorts and Populations in Chronic Toxicity Studies with Daphnia magna: A Cadmium Example. Ecotoxicol. Environ. Saf.9: 26-39.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1.8	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., W.J. Luttmer, and P.S. Griffioen. The Use of Cohorts and Populations in Chronic Toxicity Studies with Daphnia magna: A Cadmium Example. Ecotoxicol. Environ. Saf.9: 26-39.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	3.2	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., W.J. Luttmer, and P.S. Griffioen. The Use of Cohorts and Populations in Chronic Toxicity Studies with Daphnia magna: A Cadmium Example. Ecotoxicol. Environ. Saf.9: 26-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15.2	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Chandini, T.. Survival, Growth and Reproduction of Daphnia carinata (Crustacea: Cladocera) Exposed to Chronic Cadmium Stress at Different Food (Chlorella) Levels. Environ. Pollut.60(1): 29-45.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1	NA	NR	ug/L	LAB	1978. Marshall, J.S.. Population Dynamics of Daphnia galeata mendotae as Modified by Chronic Cadmium Stress. J. Fish. Res. Board Can.35(4): 461-469.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	27	NA	NR	ug/L	LAB	1992. Pittinger, C.A., D.J. Versteeg, B.A. Blatz, and E.M. Meiers. Environmental Toxicology of Succinate Tartrates. Aquat. Toxicol.24(1-2): 83-102.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Bodar, C.W.M., A.V.D. Zee, P.A. Voogt, H. Wynne, and D.I. Zandee. Toxicity of Heavy Metals to Early Life Stages of Daphnia magna. Ecotoxicol. Environ. Saf.17(3): 333-338.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	D	115	NR	NR	ug/L	LAB	1975. Lu, P.Y., R.L. Metcalf, R. Furman, R. Vogel, and J. Hassett. Model Ecosystem Studies of Lead and Cadmium and of Urban Sewage Sludge Containing These Elements. J. Environ. Qual.4(4): 505-509.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	D	4	NR	NR	ug/L	LAB	1975. Lu, P.Y., R.L. Metcalf, R. Furman, R. Vogel, and J. Hassett. Model Ecosystem Studies of Lead and Cadmium and of Urban Sewage Sludge Containing These Elements. J. Environ. Qual.4(4): 505-509.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	D	5	NR	NR	ug/L	LAB	1975. Lu, P.Y., R.L. Metcalf, R. Furman, R. Vogel, and J. Hassett. Model Ecosystem Studies of Lead and Cadmium and of Urban Sewage Sludge Containing These Elements. J. Environ. Qual.4(4): 505-509.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	6	NA	NR	ug/L	LAB	1990. Baird, D.J., I. Barber, and P. Calow. Clonal Variation in General Responses of Daphnia magna Straus to Toxic Stress. I. Chronic Life-History Effects. Funct. Ecol.4(3): 399-407.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1979. Bertram, P.E., and B.A. Hart. Longevity and Reproduction of Daphnia pulex (Degeer) Exposed to Cadmium-Contaminated Food or Water. Environ. Pollut.19(4): 295-306.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1	NA	NR	ug/L	LAB	1979. Bertram, P.E., and B.A. Hart. Longevity and Reproduction of Daphnia pulex (Degeer) Exposed to Cadmium-Contaminated Food or Water. Environ. Pollut.19(4): 295-306.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. The Effects of Cadmium-Accumulated Chlorella on the Reproduction of Moina macrocopa (Cladocera). Ecotoxicol. Environ. Saf.5: 341-350.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	3	NA	NR	ug/L	LAB	1988. Winner, R.W.. Evaluation of the Relative Sensitivities of 7-D Daphnia magna and Ceriodaphnia dubia Toxicity Tests for Cadmium and Sodium Pentachlorophenate. Environ. Toxicol. Chem.7(2): 153-159.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NA	NR	ug/L	LAB	1986. Winner, R.W., and J.D. Gauss. Relationship Between Chronic Toxicity and Bioaccumulation of Copper, Cadmium and Zinc As Affected by Water Hardness and Humic Acid. Aquat. Toxicol.8(3): 149-161.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NA	NR	ug/L	LAB	1986. Winner, R.W., and J.D. Gauss. Relationship Between Chronic Toxicity and Bioaccumulation of Copper, Cadmium and Zinc As Affected by Water Hardness and Humic Acid. Aquat. Toxicol.8(3): 149-161.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NA	NR	ug/L	LAB	1986. Winner, R.W., and J.D. Gauss. Relationship Between Chronic Toxicity and Bioaccumulation of Copper, Cadmium and Zinc As Affected by Water Hardness and Humic Acid. Aquat. Toxicol.8(3): 149-161.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Ingersoll, C.G., and R.W. Winner. Effect on Daphnia pulex (De Geer) of Daily Pulse Exposures to Copper or Cadmium. Environ. Toxicol. Chem.1: 321-327.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Ferard, J.F., J.M. Jouany, R. Truhaut, and P. Vasseur. Accumulation of Cadmium in a Freshwater Food Chain Experimental Model. Ecotoxicol. Environ. Saf.7(1): 43-52.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	5.6	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., W.J. Luttmer, and P.S. Griffioen. The Use of Cohorts and Populations in Chronic Toxicity Studies with Daphnia magna: A Cadmium Example. Ecotoxicol. Environ. Saf.9: 26-39.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	5	NA	NR	ug/L	LAB	1986. Dillon, T.M., and B.C. Suedel. The Relationship Between Cadmium Bioaccumulation and Survival, Growth, and Reproduction in the Freshwater Crustacean, Daphnia magna. In: Environ.Contam., 2nd Int.Conf., CEP Consultant, Edinburgh, U.K.: 21-23.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	16	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	90	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	6	NA	NR	ug/L	LAB	1990. Baird, D.J., I. Barber, and P. Calow. Clonal Variation in General Responses of Daphnia magna Straus to Toxic Stress. I. Chronic Life-History Effects. Funct. Ecol.4(3): 399-407.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	15	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	15	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	570	NA	NR	ug/L	LAB	1997. Decoen, W.M., and C.R. Janssen. The Use of Biomarkers in Daphnia magna Toxicity Testing. II. Digestive Enzyme Activity in Daphnia magna Exposed to Sublethal Concentrations of Cadmium, Chromium and Mercury.. Chemosphere35(5): 1053-1067.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	15	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1471	D	1069	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	80000	NR	NR	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	80000	NR	NR	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Cadmium	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.5	NA	NR	ug/L	LAB	1986. Dillon, T.M., and B.C. Suedel. The Relationship Between Cadmium Bioaccumulation and Survival, Growth, and Reproduction in the Freshwater Crustacean, Daphnia magna. In: Environ.Contam., 2nd Int.Conf., CEP Consultant, Edinburgh, U.K.: 21-23.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2008. Ferreira, A.L.G., S. Loureiro, and A.M.V.M. Soares. Toxicity Prediction of Binary Combinations of Cadmium, Carbendazim and Low Dissolved Oxygen on Daphnia magna. Aquat. Toxicol.89: 28-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	10000	NR	NR	ug/L	LAB	1986. Nebeker, A.V., S.T. Onjukka, M.A. Cairns, and D.F. Krawczyk. Survival of Daphnia magna and Hyalella azteca in Cadmium-Spiked Water and Sediment. Environ. Toxicol. Chem.5(10): 933-938.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC20	Not Reported	T	8.4	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50		T	4200	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50		T	2.6	NA	NR	ug/L	LAB	1987. Knowles, C.O., and M.J. McKee. Protein and Nucleic Acid Content in Daphnia magna during Chronic Exposure to Cadmium. Ecotoxicol. Environ. Saf.13(3): 290-300.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.1	NR	NR	ug/L	LAB	1999. Guilhermino, L., O. Sobral, C. Chastinet, R. Ribeiro, F. Goncalves, M.C. Silva, and A.M.V.M. Soares. A Daphnia magna First-Brood Chronic Test: An Alternative to the Conventional 21-Day Chronic Bioassay?. Ecotoxicol. Environ. Saf.42(1): 67-74.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	4.9	NR	NR	ug/L	LAB	1999. Guilhermino, L., O. Sobral, C. Chastinet, R. Ribeiro, F. Goncalves, M.C. Silva, and A.M.V.M. Soares. A Daphnia magna First-Brood Chronic Test: An Alternative to the Conventional 21-Day Chronic Bioassay?. Ecotoxicol. Environ. Saf.42(1): 67-74.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50		T	3.5	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4): 393-398.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	0.78	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. Effects of Cadmium on the Periodicity of Parturition and Brood Size of Moina macrocopa (Cladocera). Environ. Pollut. A.26: 111-120.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	0.64		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	2.05	NR	NR	ug/L	LAB	2000. Barata, C., and D.J. Baird. Determining the Ecotoxicological Mode of Action of Chemicals from Measurements Made on Individuals: Results from Instar-Based Tests with Daphnia magna Straus. Aquat. Toxicol.48(2-3): 195-209.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	0.97	NR	NR	ug/L	LAB	2000. Barata, C., and D.J. Baird. Determining the Ecotoxicological Mode of Action of Chemicals from Measurements Made on Individuals: Results from Instar-Based Tests with Daphnia magna Straus. Aquat. Toxicol.48(2-3): 195-209.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	12.63	NR	NR	nmol/L	LAB	2007. Barata, C., D.J. Baird, A.J.A. Nogueira, A.R. Agra, and A.M.V.M. Soares. Life-History Responses of Daphnia magna Straus to Binary Mixtures of Toxic Substances: Pharmacological Versus Ecotoxicological Modes of Action. Aquat. Toxicol.84(4): 439-449.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	22.19	NR	NR	nmol/L	LAB	2007. Barata, C., D.J. Baird, A.J.A. Nogueira, A.R. Agra, and A.M.V.M. Soares. Life-History Responses of Daphnia magna Straus to Binary Mixtures of Toxic Substances: Pharmacological Versus Ecotoxicological Modes of Action. Aquat. Toxicol.84(4): 439-449.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	0.7	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	0.06	NR	NR	ng/d	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	0.3	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	19	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	23	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	0.06	NR	NR	ng/d	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	0.3	NR	NR	g/g dry f	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	0.1	NR	NR	ng/d	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	0.9	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	19	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Progeny	T	'2E-8	NR	NR	M	LAB	2005. Baillieul, M., R. Smolders, and R. Blust. The Effect of Environmental Stress on Absolute and Mass-Specific Scope for Growth in Daphnia magna Strauss. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.140(3-4): 364-373.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	4	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	4	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	4	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	12.2	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	21.9	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	0.6	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	3	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	8.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	4	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	0.2	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4): 393-398.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	0.5	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4): 393-398.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	4.8	NR	NR	ug/L	LAB	1999. Guilhermino, L., O. Sobral, C. Chastinet, R. Ribeiro, F. Goncalves, M.C. Silva, and A.M.V.M. Soares. A Daphnia magna First-Brood Chronic Test: An Alternative to the Conventional 21-Day Chronic Bioassay?. Ecotoxicol. Environ. Saf.42(1): 67-74.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	4.8	NR	NR	ug/L	LAB	1999. Guilhermino, L., O. Sobral, C. Chastinet, R. Ribeiro, F. Goncalves, M.C. Silva, and A.M.V.M. Soares. A Daphnia magna First-Brood Chronic Test: An Alternative to the Conventional 21-Day Chronic Bioassay?. Ecotoxicol. Environ. Saf.42(1): 67-74.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	2.1	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	2.3	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	4	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	4.4	NA	NR	ug/L	LAB	1993. Enserink, L., M. De la Haye, and H. Maas. Reproductive Strategy of Daphnia magna: Implications for Chronic Toxicity Tests. Aquat. Toxicol.25: 111-124.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	0.2	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4): 393-398.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	10.2	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	10.2	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1.5	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1.5	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1.5	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	14	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	15	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	8.6	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4): 393-398.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	2.6	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4): 393-398.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	8.6	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4): 393-398.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	7.9	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	7.9	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	40	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	20	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	0.75	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	0.75	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	0.75	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	2.25	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	2.25	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	2.25	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	2.2	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	11	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	19	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Progeny	T	'0.91E-8	NR	NR	M	LAB	2005. Baillieul, M., R. Smolders, and R. Blust. The Effect of Environmental Stress on Absolute and Mass-Specific Scope for Growth in Daphnia magna Strauss. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.140(3-4): 364-373.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10.7	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	9.6	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	NR	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1.6	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	5.7	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	2.8	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	0.6	NA	NR	ug/L	LAB	1989. Kuhn, R., M. Pattard, K.D. Pernak, and A. Winter. Results of the Harmful Effects of Water Pollutants to Daphnia magna in the 21 Day Reproduction Test. Water Res.23(4): 501-510.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3.2	NR	NR	ug/L	LAB	1999. Guilhermino, L., O. Sobral, C. Chastinet, R. Ribeiro, F. Goncalves, M.C. Silva, and A.M.V.M. Soares. A Daphnia magna First-Brood Chronic Test: An Alternative to the Conventional 21-Day Chronic Bioassay?. Ecotoxicol. Environ. Saf.42(1): 67-74.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3.2	NR	NR	ug/L	LAB	1999. Guilhermino, L., O. Sobral, C. Chastinet, R. Ribeiro, F. Goncalves, M.C. Silva, and A.M.V.M. Soares. A Daphnia magna First-Brood Chronic Test: An Alternative to the Conventional 21-Day Chronic Bioassay?. Ecotoxicol. Environ. Saf.42(1): 67-74.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	5.5	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	5.5	NR	NR	ug/L	LAB	1984. Niederlehner, B.. Cadmium Toxicity to a Cladoceran. In: M.S.Thesis, Virginia Polytechnic Inst.and State University, A Comparison of Techniques for Estimating the Hazard of Chemicals in the Aquatic Environment, Chapter II: 9-130.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	0.3		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Poynton, H.C., A.V. Loguinov, J.R. Varshavsky, S. Chan, E.J. Perkins, and C.D. Vulpe. Gene Expression Profiling in Daphnia magna. Part I: Concentration-Dependent Profiles Provide Support for the No Observed Transcriptional Effect Level. Environ. Sci. Technol.42(16): 6250-6256.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	0.2	NR	NR	ug/L	LAB	2000. Barata, C., and D.J. Baird. Determining the Ecotoxicological Mode of Action of Chemicals from Measurements Made on Individuals: Results from Instar-Based Tests with Daphnia magna Straus. Aquat. Toxicol.48(2-3): 195-209.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	0.2	NR	NR	ug/L	LAB	2000. Barata, C., and D.J. Baird. Determining the Ecotoxicological Mode of Action of Chemicals from Measurements Made on Individuals: Results from Instar-Based Tests with Daphnia magna Straus. Aquat. Toxicol.48(2-3): 195-209.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1.5	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1.5	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1.5	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1990. Goerke, H., and K. Weber. Population-Dependent Elimination of Various Polychlorinated Biphenyls in Nereis diversicolor (Polychaeta). Mar. Environ. Res.29(3): 205-226.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Santojanni, A., G. Gorbi, and F. Sartore. Prediction of Fecundity in Chronic Toxicity Tests on Daphnia magna. Water Res.32(10): 3146-3156.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	1	NA	NR	ug/L	LAB	1986. Dillon, T.M., and B.C. Suedel. The Relationship Between Cadmium Bioaccumulation and Survival, Growth, and Reproduction in the Freshwater Crustacean, Daphnia magna. In: Environ.Contam., 2nd Int.Conf., CEP Consultant, Edinburgh, U.K.: 21-23.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	0.5	NA	NR	ug/L	LAB	1986. Dillon, T.M., and B.C. Suedel. The Relationship Between Cadmium Bioaccumulation and Survival, Growth, and Reproduction in the Freshwater Crustacean, Daphnia magna. In: Environ.Contam., 2nd Int.Conf., CEP Consultant, Edinburgh, U.K.: 21-23.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	0.5	NA	NR	ug/L	LAB	1986. Dillon, T.M., and B.C. Suedel. The Relationship Between Cadmium Bioaccumulation and Survival, Growth, and Reproduction in the Freshwater Crustacean, Daphnia magna. In: Environ.Contam., 2nd Int.Conf., CEP Consultant, Edinburgh, U.K.: 21-23.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	1	NA	NR	ug/L	LAB	1986. Dillon, T.M., and B.C. Suedel. The Relationship Between Cadmium Bioaccumulation and Survival, Growth, and Reproduction in the Freshwater Crustacean, Daphnia magna. In: Environ.Contam., 2nd Int.Conf., CEP Consultant, Edinburgh, U.K.: 21-23.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	L	NR	NR	NR	M	LAB	1999. Baillieul, M., and R. Blust. Analysis of the Swimming Velocity of Cadmium-Stressed Daphnia magna. Aquat. Toxicol.44: 245-254.
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	32	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., W.J. Luttmer, and P.S. Griffioen. The Use of Cohorts and Populations in Chronic Toxicity Studies with Daphnia magna: A Cadmium Example. Ecotoxicol. Environ. Saf.9: 26-39.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	1.86	NA	NR	ug/L	LAB	1989. Borgmann, U., K.M. Ralph, and W.P. Norwood. Toxicity Test Procedures for Hyalella azteca, and Chronic Toxicity of Cadmium and Pentachlorophenol to H. azteca, Gammarus fasciatus, and Daphnia magna. Arch. Environ. Contam. Toxicol.18(5): 756-764.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	NR	NA	NR	ug/L	LAB	1989. Chandini, T.. Survival, Growth and Reproduction of Daphnia carinata (Crustacea: Cladocera) Exposed to Chronic Cadmium Stress at Different Food (Chlorella) Levels. Environ. Pollut.60(1): 29-45.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Chandini, T.. Reproductive Value and the Cost of Reproduction in Daphnia carinata and Echinisca triserialis (Crustacea: Cladocera) Exposed to Food and Cadmium Stress. Bull. Environ. Contam. Toxicol.47(1): 76-83.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Baird, D.J., I. Barber, and P. Calow. Clonal Variation in General Responses of Daphnia magna Straus to Toxic Stress. I. Chronic Life-History Effects. Funct. Ecol.4(3): 399-407.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	32	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., W.J. Luttmer, and P.S. Griffioen. The Use of Cohorts and Populations in Chronic Toxicity Studies with Daphnia magna: A Cadmium Example. Ecotoxicol. Environ. Saf.9: 26-39.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	0.35	NA	NR	ug/L	LAB	1986. Biesinger, K.E., G.M. Christensen, and J.T. Fiandt. Effects of Metal Salt Mixtures on Daphnia magna Reproduction. Ecotoxicol. Environ. Saf.11(1): 9-14.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	1	NA	NR	ug/L	LAB	1988. Bodar, C.W.M., C.J. Van Leeuwen, P.A. Voogt, and D.I. Zandee. Effect of Cadmium on the Reproduction Strategy of Daphnia magna. Aquat. Toxicol.12(4): 301-310.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	5	NA	NR	ug/L	LAB	1988. Bodar, C.W.M., C.J. Van Leeuwen, P.A. Voogt, and D.I. Zandee. Effect of Cadmium on the Reproduction Strategy of Daphnia magna. Aquat. Toxicol.12(4): 301-310.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	5	NA	NR	ug/L	FIELDN	1986. Kettle, W.D.,Jr.. Effects of Cadmium Stress on the Plankton Communities of Experimental Ponds. J. Freshw. Ecol.3(4): 433-443.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Wong, C.K., and P.K. Wong. Life Table Evaluation of the Effects of Cadmium Exposure on the Freshwater Cladoceran, Moina macrocopa. Bull. Environ. Contam. Toxicol.44(1): 135-141.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1990. Wong, C.K., and P.K. Wong. Life Table Evaluation of the Effects of Cadmium Exposure on the Freshwater Cladoceran, Moina macrocopa. Bull. Environ. Contam. Toxicol.44(1): 135-141.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1990. Wong, C.K., and P.K. Wong. Life Table Evaluation of the Effects of Cadmium Exposure on the Freshwater Cladoceran, Moina macrocopa. Bull. Environ. Contam. Toxicol.44(1): 135-141.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. The Effects of Cadmium-Accumulated Chlorella on the Reproduction of Moina macrocopa (Cladocera). Ecotoxicol. Environ. Saf.5: 341-350.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. The Effects of Cadmium-Accumulated Chlorella on the Reproduction of Moina macrocopa (Cladocera). Ecotoxicol. Environ. Saf.5: 341-350.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. The Effects of Cadmium-Accumulated Chlorella on the Reproduction of Moina macrocopa (Cladocera). Ecotoxicol. Environ. Saf.5: 341-350.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	0.2	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. Effects of Cadmium on the Periodicity of Parturition and Brood Size of Moina macrocopa (Cladocera). Environ. Pollut. A.26: 111-120.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	0.4	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. Effects of Cadmium on the Periodicity of Parturition and Brood Size of Moina macrocopa (Cladocera). Environ. Pollut. A.26: 111-120.
Cadmium chloride (CdCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	5	NA	NR	ug/L	FIELDN	1986. Kettle, W.D.,Jr.. Effects of Cadmium Stress on the Plankton Communities of Experimental Ponds. J. Freshw. Ecol.3(4): 433-443.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	1	NA	NR	ug/L	LAB	1988. Winner, R.W.. Evaluation of the Relative Sensitivities of 7-D Daphnia magna and Ceriodaphnia dubia Toxicity Tests for Cadmium and Sodium Pentachlorophenate. Environ. Toxicol. Chem.7(2): 153-159.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	2	NA	NR	ug/L	LAB	1988. Winner, R.W.. Evaluation of the Relative Sensitivities of 7-D Daphnia magna and Ceriodaphnia dubia Toxicity Tests for Cadmium and Sodium Pentachlorophenate. Environ. Toxicol. Chem.7(2): 153-159.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1987. Winner, R.W., and T.C. Whitford. The Interactive Effects of a Cadmium Stress, a Selenium Deficiency and Water Temperature on the Survival and Reproduction of Daphnia magna Straus. Aquat. Toxicol.10(4): 217-224.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Ingersoll, C.G., and R.W. Winner. Effect on Daphnia pulex (De Geer) of Daily Pulse Exposures to Copper or Cadmium. Environ. Toxicol. Chem.1: 321-327.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	2.7	NA	NR	ug/L	LAB	1986. Winner, R.W.. Interactive Effects of Water Hardness and Humic Acid on the Chronic Toxicity of Cadmium to Daphnia pulex. Aquat. Toxicol.8(4): 281-293.

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	5.6	NA	NR	ug/L	LAB	1986. Winner, R.W.. Interactive Effects of Water Hardness and Humic Acid on the Chronic Toxicity of Cadmium to Daphnia pulex. Aquat. Toxicol.8(4): 281-293.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	10.4	NA	NR	ug/L	LAB	1986. Winner, R.W.. Interactive Effects of Water Hardness and Humic Acid on the Chronic Toxicity of Cadmium to Daphnia pulex. Aquat. Toxicol.8(4): 281-293.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	20.4	NA	NR	ug/L	LAB	1984. Winner, R.W.. The Toxicity and Bioaccumulation of Cadmium and Copper as Affected by Humic Acid. Aquat. Toxicol.5(3): 267-274.
Sulfuric acid, Cadmium salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	5.2	NA	NR	ug/L	LAB	1986. Winner, R.W.. Interactive Effects of Water Hardness and Humic Acid on the Chronic Toxicity of Cadmium to Daphnia pulex. Aquat. Toxicol.8(4): 281-293.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	5	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	5	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	5	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.
Nitric acid, Cadmium salt	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	5	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.
Cadmium chloride (CdCl2)	Water Mite	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1992. Timmermans, K.R., E. Spijkerman, M. Tonkes, and H. Govers. Cadmium and Zinc Uptake by Two Species of Aquatic Invertebrate Predators from Dietary and Aqueous Sources. Can. J. Fish. Aquat. Sci.49(4): 655-662.
Cadmium chloride (CdCl2)	Water Scorpion	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	497	NA	NR	ug/L	LAB	1983. Shukla, G.S., R. Murti, and Omkar. Cadmium and Zinc Toxicity to an Aquatic Insect, Ranatra elongata (Fabr.). Toxicol. Lett.15(1): 39-41.
Cadmium chloride (CdCl2)	Water Scorpion	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	438	NA	NR	ug/L	LAB	1983. Shukla, G.S., R. Murti, and Omkar. Cadmium and Zinc Toxicity to an Aquatic Insect, Ranatra elongata (Fabr.). Toxicol. Lett.15(1): 39-41.
Cadmium chloride (CdCl2)	Water Scorpion	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	355	NA	NR	ug/L	LAB	1983. Shukla, G.S., R. Murti, and Omkar. Cadmium and Zinc Toxicity to an Aquatic Insect, Ranatra elongata (Fabr.). Toxicol. Lett.15(1): 39-41.
Cadmium chloride (CdCl2)	Water Scorpion	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	288	NA	NR	ug/L	LAB	1983. Shukla, G.S., R. Murti, and Omkar. Cadmium and Zinc Toxicity to an Aquatic Insect, Ranatra elongata (Fabr.). Toxicol. Lett.15(1): 39-41.
Cadmium chloride (CdCl2)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1692	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Cadmium chloride (CdCl2)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	913	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Cadmium chloride (CdCl2)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	673	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Cadmium chloride (CdCl2)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	494	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Cadmium chloride (CdCl2)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	2100	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Cadmium chloride (CdCl2)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1275	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Cadmium chloride (CdCl2)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Cadmium	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	16500	NR	NR	ug/L	LAB	1998. Rayms-Keller, A., K.E. Olson, M. McGaw, C. Oray, J.O. Carlson, and B.J. Beaty. Effect of Heavy Metals on Aedes aegypti (Diptera: Culicidae) Larvae. Ecotoxicol. Environ. Saf.39(1): 41-47.
Sulfuric acid, Cadmium salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1900	NR	NR	ug/L	LAB	1978. Simonet, D.E., W.I. Knausenberger, L.H.,Jr. Townsend, and E.C.,Jr. Turner. A Biomonitoring Procedure Utilizing Negative Phototaxis of First Instar Aedes aegypti Larvae. Arch. Environ. Contam. Toxicol.7(3): 339-347.
Sulfuric acid, Cadmium salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	1978. Simonet, D.E., W.I. Knausenberger, L.H.,Jr. Townsend, and E.C.,Jr. Turner. A Biomonitoring Procedure Utilizing Negative Phototaxis of First Instar Aedes aegypti Larvae. Arch. Environ. Contam. Toxicol.7(3): 339-347.
Nitric acid, Cadmium salt	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	18000	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..

Table B-7. Summary of Results from the EcoTox Database for Invertebrates - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Cadmium salt	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	11000	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Nitric acid, Cadmium salt	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	23100	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Cadmium	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NR	NR	ug/L	LAB	1998. Rayms-Keller, A., K.E. Olson, M. McGaw, C. Oray, J.O. Carlson, and B.J. Beaty. Effect of Heavy Metals on Aedes aegypti (Diptera: Culicidae) Larvae. Ecotoxicol. Environ. Saf.39(1): 41-47.
Cadmium	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	1998. Rayms-Keller, A., K.E. Olson, M. McGaw, C. Oray, J.O. Carlson, and B.J. Beaty. Effect of Heavy Metals on Aedes aegypti (Diptera: Culicidae) Larvae. Ecotoxicol. Environ. Saf.39(1): 41-47.
Cadmium chloride (CdCl2)	Yellow Sandshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Cadmium chloride (CdCl2)	Yellow Sandshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	33	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Cadmium chloride (CdCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	Lefcort et al. 1998. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	0.13		NC	uM	LAB	Mudgall and Patil, 1985. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	0.133		NC	uM	LAB	Mudgall and Patil, 1985. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	410	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

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Table B-8. Summary of Results from the EcoTox Database for Invertebrates - Cesium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Cesium salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	323	L	281	mM	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Cesium chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7400	NA	NR	ug/L	LAB	1974. Baudouin, M.F., and P. Scoppa. Acute Toxicity of Various Metals to Freshwater Zooplankton. Bull. Environ. Contam. Toxicol.12(6): 745-751.

Table B-9. Summary of Results from the EcoTox Database for Invertebrates - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.
Chlordane	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1960. Ludemann, D., and H. Neumann. Studies on the Acute Toxicity of Modern Contact Insecticides in Fresh Water. II. Z. Angew. Zool.47: 303-321.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Aquatic Sowbug, Isopod	Crustaceans	NR	Mortality	LC50	Not Reported	F	NR	NA	NR	ug/L	LAB	1972. Kaim-Malka, R.A.. Action of Nonionic Detergents on the Valviferous Isopod Idotea balthica basteri In Vitro 1827. Tethys4(1): 51-61.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Aquatic Sowbug, Isopod	Crustaceans	NR	Mortality	LC50	Not Reported	F	NR	NA	NR	ug/L	LAB	1972. Kaim-Malka, R.A.. Action of Nonionic Detergents on the Valviferous Isopod Idotea balthica basteri In Vitro 1827. Tethys4(1): 51-61.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Caddisfly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	F	2000	NA	NR	ug/L	FIELDN	1949. Cope, O.B., C.M. Gjullin, and A. Storm. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Trans. Am. Fish. Soc.77: 160-177.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Caddisfly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	F	1000	NA	NR	ug/L	FIELDN	1949. Cope, O.B., C.M. Gjullin, and A. Storm. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Trans. Am. Fish. Soc.77: 160-177.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Caddisfly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	F	4000	NA	NR	ug/L	FIELDN	1949. Cope, O.B., C.M. Gjullin, and A. Storm. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Trans. Am. Fish. Soc.77: 160-177.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Caddisfly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	F	500	NA	NR	ug/L	FIELDN	1949. Cope, O.B., C.M. Gjullin, and A. Storm. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Trans. Am. Fish. Soc.77: 160-177.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Caddisfly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	F	6000	NA	NR	ug/L	FIELDN	1949. Cope, O.B., C.M. Gjullin, and A. Storm. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Trans. Am. Fish. Soc.77: 160-177.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Common Malaria Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	100	NA	NR	ug/L	LAB	1956. LaBrecque, G.C., J.R. Noe, and J.B. Gahan. Effectiveness of Insecticides on Granular Clay Carriers Against Mosquito Larvae. Mosq. News16: 1-3.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Common Malaria Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	100	NA	NR	ug/L	LAB	1956. LaBrecque, G.C., J.R. Noe, and J.B. Gahan. Effectiveness of Insecticides on Granular Clay Carriers Against Mosquito Larvae. Mosq. News16: 1-3.
alpha Chlordane	Common Malaria Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	100	NA	NR	ug/L	LAB	1956. LaBrecque, G.C., J.R. Noe, and J.B. Gahan. Effectiveness of Insecticides on Granular Clay Carriers Against Mosquito Larvae. Mosq. News16: 1-3.
alpha Chlordane	Common Malaria Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	100	NA	NR	ug/L	LAB	1956. LaBrecque, G.C., J.R. Noe, and J.B. Gahan. Effectiveness of Insecticides on Granular Clay Carriers Against Mosquito Larvae. Mosq. News16: 1-3.
Chlordane	Copepod Order	Crustaceans	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1968. Naqvi, S.M., and D.E. Ferguson. Pesticide Tolerances of Selected Freshwater Invertebrates. J. Miss. Acad. Sci.14: 121-127.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.
Chlordane	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1960. Ludemann, D., and H. Neumann. Studies on the Acute Toxicity of Modern Contact Insecticides in Fresh Water. II. Z. Angew. Zool.47: 303-321.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.
Chlordane	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1960. Ludemann, D., and H. Neumann. Studies on the Acute Toxicity of Modern Contact Insecticides in Fresh Water. II. Z. Angew. Zool.47: 303-321.
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	90	NA	NR	ug/L	LAB	1972. Sanders, H.O.. Toxicity of Some Insecticides to Four Species of Malacostracan Crustaceans. Tech.Pap.No.66, Bur.Sports Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, D.C.: 19 p..
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	120	NA	NR	ug/L	LAB	1972. Sanders, H.O.. Toxicity of Some Insecticides to Four Species of Malacostracan Crustaceans. Tech.Pap.No.66, Bur.Sports Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, D.C.: 19 p..
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	32	NA	NR	ug/L	LAB	1972. Sanders, H.O.. Toxicity of Some Insecticides to Four Species of Malacostracan Crustaceans. Tech.Pap.No.66, Bur.Sports Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, D.C.: 19 p..
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	10	NA	NR	ug/L	LAB	1972. Sanders, H.O.. Toxicity of Some Insecticides to Four Species of Malacostracan Crustaceans. Tech.Pap.No.66, Bur.Sports Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, D.C.: 19 p..
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	4	NA	NR	ug/L	LAB	1972. Sanders, H.O.. Toxicity of Some Insecticides to Four Species of Malacostracan Crustaceans. Tech.Pap.No.66, Bur.Sports Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, D.C.: 19 p..

Table B-9. Summary of Results from the EcoTox Database for Invertebrates - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	10	NA	NR	ug/L	LAB	1972. Sanders, H.O.. Toxicity of Some Insecticides to Four Species of Malacostracan Crustaceans. Tech.Pap.No.66, Bur.Sports Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, D.C.: 19 p..
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	2.5	NA	NR	ug/L	LAB	1972. Sanders, H.O.. Toxicity of Some Insecticides to Four Species of Malacostracan Crustaceans. Tech.Pap.No.66, Bur.Sports Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, D.C.: 19 p..
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	8	NA	NR	ug/L	LAB	1972. Sanders, H.O.. Toxicity of Some Insecticides to Four Species of Malacostracan Crustaceans. Tech.Pap.No.66, Bur.Sports Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, D.C.: 19 p..
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50*	Not Reported	F	13.6	NA	NR	ug/L	LAB	1970. Naqvi, S.M., and D.E. Ferguson. Levels of Insecticide Resistance in Fresh-Water Shrimp, Palaemonetes kadiakensis. Trans. Am. Fish. Soc.99(4): 696-699.
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50*	Not Reported	F	190.7	NA	NR	ug/L	LAB	1970. Naqvi, S.M., and D.E. Ferguson. Levels of Insecticide Resistance in Fresh-Water Shrimp, Palaemonetes kadiakensis. Trans. Am. Fish. Soc.99(4): 696-699.
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50*	Not Reported	F	334	NA	NR	ug/L	LAB	1970. Naqvi, S.M., and D.E. Ferguson. Levels of Insecticide Resistance in Fresh-Water Shrimp, Palaemonetes kadiakensis. Trans. Am. Fish. Soc.99(4): 696-699.
Chlordane	Grass Shrimp,Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50*	Not Reported	F	77.9	NA	NR	ug/L	LAB	1970. Naqvi, S.M., and D.E. Ferguson. Levels of Insecticide Resistance in Fresh-Water Shrimp, Palaemonetes kadiakensis. Trans. Am. Fish. Soc.99(4): 696-699.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	8600	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	6800	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	6000	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	6000	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Chlordane	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1993. Sweeney, B.W., D.H. Funk, and L.J. Standley. Use of the Stream Mayfly Cloeon triangulifer as a Bioassay Organism: Life History Response and Body Burden Following Exposure to Technical Chlordane. Environ. Toxicol. Chem.12(1): 115-125.
Chlordane	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	4.3	NA	NR	ug/L	LAB	1993. Sweeney, B.W., D.H. Funk, and L.J. Standley. Use of the Stream Mayfly Cloeon triangulifer as a Bioassay Organism: Life History Response and Body Burden Following Exposure to Technical Chlordane. Environ. Toxicol. Chem.12(1): 115-125.
Chlordane	Mayfly	Insects/Spiders	Fresh	Reproduction	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1993. Sweeney, B.W., D.H. Funk, and L.J. Standley. Use of the Stream Mayfly Cloeon triangulifer as a Bioassay Organism: Life History Response and Body Burden Following Exposure to Technical Chlordane. Environ. Toxicol. Chem.12(1): 115-125.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	A	5.8	NR	NR	ug/L	LAB	1998. Moore, M.T., D.B. Huggett, W.B.,Jr. Gillespie, J.H.,Jr. Rodgers, and C.M. Cooper. Comparative Toxicity of Chlordane, Chlorpyrifos, and Aldicarb to Four Aquatic Testing Organisms. Arch. Environ. Contam. Toxicol.34(2): 152-157.
Chlordane	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	10	NR	NR	ug/L	LAB	1960. Ludemann, D., and H. Neumann. Studies on the Acute Toxicity of Modern Contact Insecticides in Fresh Water. III. Chironomid Larvae. Z. Angew. Zool.47: 493-505.
Chlordane	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	A	1440	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Midge	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	A	1	NR	NR	ug/L	LAB	1998. Moore, M.T., D.B. Huggett, W.B.,Jr. Gillespie, J.H.,Jr. Rodgers, and C.M. Cooper. Comparative Toxicity of Chlordane, Chlorpyrifos, and Aldicarb to Four Aquatic Testing Organisms. Arch. Environ. Contam. Toxicol.34(2): 152-157.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.

Table B-9. Summary of Results from the EcoTox Database for Invertebrates - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	A	880	NA	NR	ug/L	LAB	1993. Keller, A.E.. Acute Toxicity of Several Pesticides, Organic Compounds, and a Wastewater Effluent to the Freshwater Mussel, Anodonta imbecilis, Ceriodaphnia dubia, and Pimephales promelas. Bull. Environ. Contam. Toxicol.51(5): 696-702.
Chlordane	Oligochaete	Worms	Fresh	Mortality	NR-LETH	Not Reported	A	500	NA	NR	ug/L	LAB	1973. Naqvi, S.M.Z.. Toxicity of Twenty-Three Insecticides to a Tubificid Worm Branchiura sowerbyi from the Mississippi Delta. J. Econ. Entomol.66(1): 70-74.
Chlordane	Oligochaete	Worms	Fresh	Mortality	NR-LETH	Not Reported	A	500	NA	NR	ug/L	LAB	1973. Naqvi, S.M.Z.. Toxicity of Twenty-Three Insecticides to a Tubificid Worm Branchiura sowerbyi from the Mississippi Delta. J. Econ. Entomol.66(1): 70-74.
Chlordane	Oligochaete	Worms	Fresh	Mortality	NR-ZERO	Not Reported	A	500	NA	NR	ug/L	LAB	1973. Naqvi, S.M.Z.. Toxicity of Twenty-Three Insecticides to a Tubificid Worm Branchiura sowerbyi from the Mississippi Delta. J. Econ. Entomol.66(1): 70-74.
Chlordane	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1800	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
Chlordane	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1400	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Phantom Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.
Chlordane	Phantom Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1960. Ludemann, D., and H. Neumann. Studies on the Acute Toxicity of Modern Contact Insecticides in Fresh Water. II. Z. Angew. Zool.47: 303-321.
Chlordane	Scud	Crustaceans	Fresh	Growth	NR	Not Reported	A	11.5	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	100	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	40	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	61.1	NR	NR	ug/L	LAB	1998. Moore, M.T., D.B. Huggett, W.B.,Jr. Gillespie, J.H.,Jr. Rodgers, and C.M. Cooper. Comparative Toxicity of Chlordane, Chlorpyrifos, and Aldicarb to Four Aquatic Testing Organisms. Arch. Environ. Contam. Toxicol.34(2): 152-157.
Chlordane	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	100	NA	NR	ug/L	LAB	1972. Sanders, H.O.. Toxicity of Some Insecticides to Four Species of Malacostracan Crustaceans. Tech.Pap.No.66, Bur.Sports Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, D.C.: 19 p..
Chlordane	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	40	NA	NR	ug/L	LAB	1972. Sanders, H.O.. Toxicity of Some Insecticides to Four Species of Malacostracan Crustaceans. Tech.Pap.No.66, Bur.Sports Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, D.C.: 19 p..
Chlordane	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	160	NA	NR	ug/L	LAB	1969. Sanders, H.O.. Toxicity of Pesticides to the Crustacean Gammarus lacustris. Tech.Pap.No.25, U.S.D.I., Bur.Sports Fish.Wildl., Fish Wildl.Serv., Washington, DC: 18 p..
Chlordane	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	80	NA	NR	ug/L	LAB	1969. Sanders, H.O.. Toxicity of Pesticides to the Crustacean Gammarus lacustris. Tech.Pap.No.25, U.S.D.I., Bur.Sports Fish.Wildl., Fish Wildl.Serv., Washington, DC: 18 p..
Chlordane	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	26	NA	NR	ug/L	LAB	1969. Sanders, H.O.. Toxicity of Pesticides to the Crustacean Gammarus lacustris. Tech.Pap.No.25, U.S.D.I., Bur.Sports Fish.Wildl., Fish Wildl.Serv., Washington, DC: 18 p..
Chlordane	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	97.1	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	A	40	NR	NR	ug/L	LAB	1998. Moore, M.T., D.B. Huggett, W.B.,Jr. Gillespie, J.H.,Jr. Rodgers, and C.M. Cooper. Comparative Toxicity of Chlordane, Chlorpyrifos, and Aldicarb to Four Aquatic Testing Organisms. Arch. Environ. Contam. Toxicol.34(2): 152-157.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chlordane	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	A	20.5	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Scud Order	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	26	NR	NR	ug/L	LAB	1974. Mayer, F.L.,Jr.. Pesticides as Pollutants. In: B.G.Liptak (Ed.), Environmental Engineer's Handbook, Chilton Book Co., Radnor, PA: 405-418.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Scud Order	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.
Chlordane	Scud Order	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1960. Ludemann, D., and H. Neumann. Studies on the Acute Toxicity of Modern Contact Insecticides in Fresh Water. II. Z. Angew. Zool.47: 303-321.
Chlordane	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	A	1250	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	170	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	55	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	15	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Chlordane	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	A	170	NA	NR	ug/L	LAB	1968. Sanders, H.O., and O.B. Cope. The Relative Toxicities of Several Pesticides to Naiads of Three Species of Stoneflies. Limnol. Oceanogr.13(1): 112-117.
Chlordane	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	A	55	NA	NR	ug/L	LAB	1968. Sanders, H.O., and O.B. Cope. The Relative Toxicities of Several Pesticides to Naiads of Three Species of Stoneflies. Limnol. Oceanogr.13(1): 112-117.
Chlordane	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	A	15	NA	NR	ug/L	LAB	1968. Sanders, H.O., and O.B. Cope. The Relative Toxicities of Several Pesticides to Naiads of Three Species of Stoneflies. Limnol. Oceanogr.13(1): 112-117.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Tubificid Worm	Worms	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.
Chlordane	Tubificid Worm	Worms	Fresh	Mortality	NR	Not Reported	A	1500	NA	NR	ug/L	LAB	1968. Naqvi, S.M., and D.E. Ferguson. Pesticide Tolerances of Selected Freshwater Invertebrates. J. Miss. Acad. Sci.14: 121-127.
Chlordane	Tubificid Worm	Worms	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1960. Ludemann, D., and H. Neumann. Studies on the Acute Toxicity of Modern Contact Insecticides in Fresh Water. II. Z. Angew. Zool.47: 303-321.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Turbellarian, Flatworm	Worms	Fresh	Growth	EC50	Not Reported	F	NR	NA	NR	ug/L	LAB	1981. Best, J.B., M. Morita, and B. Abbotts. Acute Toxic Responses of the Freshwater Planarian, Dugesia dorotocephala, to Chlordane. Bull. Environ. Contam. Toxicol.26(4): 502-507.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Turbellarian, Flatworm	Worms	Fresh	Growth	EC50	Not Reported	F	NR	NA	NR	ug/L	LAB	1981. Best, J.B., M. Morita, and B. Abbotts. Acute Toxic Responses of the Freshwater Planarian, Dugesia dorotocephala, to Chlordane. Bull. Environ. Contam. Toxicol.26(4): 502-507.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NA	NR	ug/L	LAB	1981. Best, J.B., M. Morita, and B. Abbotts. Acute Toxic Responses of the Freshwater Planarian, Dugesia dorotocephala, to Chlordane. Bull. Environ. Contam. Toxicol.26(4): 502-507.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	F	NR	NA	NR	ug/L	LAB	1981. Best, J.B., M. Morita, and B. Abbotts. Acute Toxic Responses of the Freshwater Planarian, Dugesia dorotocephala, to Chlordane. Bull. Environ. Contam. Toxicol.26(4): 502-507.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	F	320	NA	NR	ug/L	LAB	1974. See, C.L., A.L.,Jr. Buikema, and J.,Jr. Cairns. The Effects of Selected Toxicants on Survival of Dugesia tigrina (Turbellaria). ASB (Assoc. Southeast. Biol.) Bull.21(2): 82.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Turbellarian, Flatworm	Worms	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1981. Best, J.B., M. Morita, and B. Abbotts. Acute Toxic Responses of the Freshwater Planarian, Dugesia dorotocephala, to Chlordane. Bull. Environ. Contam. Toxicol.26(4): 502-507.
Chlordane	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	A	21.6	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..

Table B-9. Summary of Results from the EcoTox Database for Invertebrates - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
2,3,4,5,6,6a,7,7-Octachloro-1a,1b,5,5a,6,6a-hexahydro-2,5-methano-2H-indeno[1,2-b]oxlrene	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	A	1300	NA	NR	ug/L	LAB	1991. Brooke, L.T.. Results of Freshwater Exposures with the Chemicals Atrazine, Biphenyl, Butachlor, Carbaryl, Carbazole, Dibenzofuran, 3,3'-Dichlorobenzidine, Dichlorvos, 1,2-Epoxyethylbenzene (Styrene Oxide), Isophorone, Isopropalin, Oxy. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 110 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	98.4	NR	NR	ug/L	LAB	1998. Moore, M.T., D.B. Huggett, W.B.,Jr. Gillespie, J.H.,Jr. Rodgers, and C.M. Cooper. Comparative Toxicity of Chlordane, Chlorpyrifos, and Aldicarb to Four Aquatic Testing Organisms. Arch. Environ. Contam. Toxicol.34(2): 152-157.
Chlordane	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	35	NA	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Chlordane	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	270	NA	NR	ug/L	LAB	1986. Hall, W.S., K.L. Dickson, F.Y. Saleh, and J.H.,Jr. Rodgers. Effects of Suspended Solids on the Bioavailability of Chlordane to Daphnia magna. Arch. Environ. Contam. Toxicol.15(5): 529-534.
Chlordane	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	42.2	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	31.1	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	37.5	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	28.4	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	35.2	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	A	70	NR	NR	ug/L	LAB	1998. Moore, M.T., D.B. Huggett, W.B.,Jr. Gillespie, J.H.,Jr. Rodgers, and C.M. Cooper. Comparative Toxicity of Chlordane, Chlorpyrifos, and Aldicarb to Four Aquatic Testing Organisms. Arch. Environ. Contam. Toxicol.34(2): 152-157.
Chlordane	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1986. Hall, W.S., K.L. Dickson, F.Y. Saleh, and J.H.,Jr. Rodgers. Effects of Suspended Solids on the Bioavailability of Chlordane to Daphnia magna. Arch. Environ. Contam. Toxicol.15(5): 529-534.
Chlordane	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1986. Hall, W.S., K.L. Dickson, F.Y. Saleh, and J.H.,Jr. Rodgers. Effects of Suspended Solids on the Bioavailability of Chlordane to Daphnia magna. Arch. Environ. Contam. Toxicol.15(5): 529-534.
Chlordane	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	A	21.6	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1984. Hattori, M., K. Senoo, S. Harada, Y. Ishizu, and M. Goto. The Daphnia Reproduction Test of Some Environmental Chemicals. Seitai Kagaku6(4): 23-27.
Chlordane	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	A	21.6	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	63	NA	NR	ug/L	LAB	1947. Ginsburg, J.M.. Tests with New Toxicants, in Comparison with DDT, on Mosquito Larvae and Fish. Proc. N. J. Mosq. Exterm. Assoc.34: 132-135.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	F	200	NA	NR	ug/L	LAB	1947. Ginsburg, J.M.. Tests with New Toxicants, in Comparison with DDT, on Mosquito Larvae and Fish. Proc. N. J. Mosq. Exterm. Assoc.34: 132-135.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Zebra Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.
Chlordane	Zebra Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1960. Ludemann, D., and H. Neumann. Studies on the Acute Toxicity of Modern Contact Insecticides in Fresh Water. II. Z. Angew. Zool.47: 303-321.

Table B-10. Summary of Results from the EcoTox Database for Invertebrates - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sodium Chromate (Na2CrO4)	Amphipod	Crustaceans	Fresh	Mortality	LC50		AM	137			ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Chromium oxide (CrO3)	Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11.5	NA	NR	ug/L	LAB	1986. Abraham, T.J., K.Y.M. Salih, and J. Chacko. Effects of Heavy Metals on the Filtration Rate of Bivalve Villorita cyprinoides (Hanley) var. cochinensis. Indian J. Mar. Sci.15(3): 195-196.
Chromium	Bryozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1560	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Chromium	Bryozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1440	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Chromium	Bryozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	650	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Chromium chloride	Caddisfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	64000	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Chromium	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	5800	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	50000	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1010	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1340	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	730	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1060	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1480	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	590	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	790	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	390	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	560	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	710	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	990	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	1200	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	1800	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	3400	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.

Table B-10. Summary of Results from the EcoTox Database for Invertebrates - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	1800	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	3100	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Chromium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	6600	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Chromium	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC5	Not Reported	T	45000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC5	Not Reported	T	55500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC5	Not Reported	T	63000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium oxide (CrO3)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	583	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Chromium	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10470	NA	NR	ug/L	LAB	1988. Abbasi, S.A., P.C. Nipaney, and R. Soni. Studies on Environmental Management of Mercury (II), Chromium (VI) and Zinc (II) with Respect to the Impact on Some Arthropods and Protozoans - Toxicity of Zinc (II). Int. J. Environ. Stud.32: 181-187.
Chromium	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	109000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	92500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	97000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC95	Not Reported	T	131000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC95	Not Reported	T	149000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC95	Not Reported	T	156000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	46000	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	43100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium chloride	Freshwater Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	125000	NR	NR	ug/L	LAB	1998. Sridevi, B., K.V. Reddy, and S.L.N. Reddy. Effect of Trivalent and Hexavalent Chromium on Antioxidant Enzyme Activities and Lipid Peroxidation in a Freshwater Field Crab, Barytelphusa guerini. Bull. Environ. Contam. Toxicol.61(3): 384-390.
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	815		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	571		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	333		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	325		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1202		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1018		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	654		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	633		NR	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	1772		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	1812		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.

Table B-10. Summary of Results from the EcoTox Database for Invertebrates - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	1312		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Chromium oxide (CrO3)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	1199		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Chromium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Chromium oxide (CrO3)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	83150	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Chromium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1780	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2110	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2320	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2640	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2640	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2640	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3250	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3250	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3400	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3400	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3700	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.

Table B-10. Summary of Results from the EcoTox Database for Invertebrates - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3700	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3700	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Chromium	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	16500	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	11000	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1187	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Chromium	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	295	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Chromium	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	39	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Chromium	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	618	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Nitric acid, Chromium(3+) salt	Mussel	Molluscs	Fresh	Mortality	LT50	Not Reported	T	150000	NA	NR	ug/L	LAB	1978. Chin, H.C., and F.F. Chou. Acute Chromium Toxicity of the Freshwater Mussel, Hyriopsis cumingii Lea. Nan-Ching Ta Hsueh Hsueh Pao, Tzu Jan K'O Hsueh4: 96-101.
Nitric acid, Chromium(3+) salt	Mussel	Molluscs	Fresh	Mortality	LT50	Not Reported	T	50000	NA	NR	ug/L	LAB	1978. Chin, H.C., and F.F. Chou. Acute Chromium Toxicity of the Freshwater Mussel, Hyriopsis cumingii Lea. Nan-Ching Ta Hsueh Hsueh Pao, Tzu Jan K'O Hsueh4: 96-101.
Nitric acid, Chromium(3+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	18.6	L	18.2	mM	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Sulfuric acid, Chromium(3+)salt(3:2)	Nematode	Worms	Fresh	Mortality	NOEC	Not Reported	T	150000	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Sulfuric acid, Chromium(3+)salt(3:2)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Chromium(3+)salt(3:2)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Jaworska, M., J. Sepiol, and P. Tomasik. Effect of Metal Ions Under Laboratory Conditions on the Entomopathogenic Steinernema carpocapsae (Rhabditida: Steinernematidae). Water Air Soil Pollut.88(3-4): 331-341.
Chromium	Oligochaete	Worms	Fresh	Mortality	LC5	Not Reported	T	118500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Oligochaete	Worms	Fresh	Mortality	LC5	Not Reported	T	181500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Oligochaete	Worms	Fresh	Mortality	LC5	Not Reported	T	178500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	136500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	204000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	207500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	12100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	9300	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium	Oligochaete	Worms	Fresh	Mortality	LC95	Not Reported	T	227500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Oligochaete	Worms	Fresh	Mortality	LC95	Not Reported	T	239000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Oligochaete	Worms	Fresh	Mortality	LC95	Not Reported	T	152500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Sulfuric acid, Chromium(3+)salt(3:2)	Planaria	Worms	Fresh	Growth	NR	Heart	T	NR	NR	NR	ug/L	LAB	1998. Calevro, F., C. Filippi, P. Deri, C. Albertosi, and R. Batistoni. Toxic Effects of Aluminium, Chromium and Cadmium in Intact and Regenerating Freshwater Planarians. Chemosphere37(4): 651-659.
Sulfuric acid, Chromium(3+)salt(3:2)	Planaria	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Calevro, F., C. Filippi, P. Deri, C. Albertosi, and R. Batistoni. Toxic Effects of Aluminium, Chromium and Cadmium in Intact and Regenerating Freshwater Planarians. Chemosphere37(4): 651-659.
Sulfuric acid, Chromium(3+)salt(3:2)	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	75000	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Nitric acid, Chromium(3+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	152	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Nitric acid, Chromium(3+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	139	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Chromium	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	8300	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Chromium	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	4410		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Chromium	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3260		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Chromium	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	4500		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Chromium	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	3000		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Chromium	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	3000		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Chromium	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	3000		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Chromium	Rotifer	Invertebrates	Fresh	Reproduction	EC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Chromium	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	3200	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Chromium	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	2000	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Chromium	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	6400	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.

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Chromium	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	3200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium oxide (CrO3)	Snail	Molluscs	Fresh	Mortality	LT50	Not Reported	T	700	NA	NR	ug/L	LAB	1977. Ravera, O.. Effects of Heavy Metals (Cadmium, Copper, Chromium and Lead) on a Freshwater Snail: Biomphalaria glabrata Say (Gastropoda, Prosobranchia). Malacologia16(1): 231-236.
Chromium chloride	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Chromium chloride	Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	10000	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Chromium oxide (CrO3)	Southern House Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	38000	NR	NR	ug/L	LAB	2006. Sorensen, M.A., P.D. Jensen, W.E. Walton, and J.T. Trumble. Acute and Chronic Activity of Perchlorate and Hexavalent Chromium Contamination on the Survival and Development of Culex quinquefasciatus Say (Diptera: Culicidae). Environ. Pollut.144(3): 759-764.
Chromium oxide (CrO3)	Southern House Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	410	NR	NR	ug/L	LAB	2006. Sorensen, M.A., P.D. Jensen, W.E. Walton, and J.T. Trumble. Acute and Chronic Activity of Perchlorate and Hexavalent Chromium Contamination on the Survival and Development of Culex quinquefasciatus Say (Diptera: Culicidae). Environ. Pollut.144(3): 759-764.
Chromium	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	10200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	15200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	12400	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	8400	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Chromium chloride	Swan Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	2006. Lopes-Lima, M., G. Moura, B. Pratoomchat, and J. Machado. Correlation Between the Morpho-Cytohistochemistry of the Outer Mantle Epithelium of Anodonta cygnea with Seasonal Variations and Following Pollutant Exposure. Mar. Freshw. Behav. Physiol.39(3): 235-243.
Chromium chloride	Trematode Parasite	Worms	Fresh	Mortality	NR	Not Reported	T	0.9	NA	NR	mmol	LAB	1988. Wolmarans, C.T., E. Yssel, and V.L. Hamilton-Attwell. Toxic Effects of Chromium on Schistosoma haematobium miracidia. Bull. Environ. Contam. Toxicol.41(6): 928-935.
Chromium chloride	Trematode Parasite	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	1.8	NA	NR	mmol	LAB	1988. Wolmarans, C.T., E. Yssel, and V.L. Hamilton-Attwell. Toxic Effects of Chromium on Schistosoma haematobium miracidia. Bull. Environ. Contam. Toxicol.41(6): 928-935.
Chromium oxide (CrO3)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	4360	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Chromium oxide (CrO3)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	3160	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Chromium oxide (CrO3)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	2910	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Chromium	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	2220	NA	NR	ug/L	LAB	1974. See, C.L., A.L.,Jr. Buikema, and J.,Jr. Cairns. The Effects of Selected Toxicants on Survival of Dugesia tigrina (Turbellaria). ASB (Assoc. Southeast. Biol.) Bull.21(2): 82.
Chromium	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Gorbi, G., M.G. Corradi, A. Torelli, and M. Bassi. Comparison Between a Normal and a Cr-Tolerant Strain of Scenedesmus acutus as a Food Source to Daphnia magna. Ecotoxicol. Environ. Saf.35(2): 109-111.
Chromium	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1998. Santojanni, A., G. Gorbi, and F. Sartore. Prediction of Fecundity in Chronic Toxicity Tests on Daphnia magna. Water Res.32(10): 3146-3156.
Chromium	Water Flea	Crustaceans	Fresh	Growth	NR		T	5	NA	NR	ug/L	LAB	1991. Munzinger, A., and F. Monicelli. A Comparison of the Sensitivity of Three Daphnia magna Populations Under Chronic Heavy Metal Stress. Ecotoxicol. Environ. Saf.22: 24-31.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	LC25	Not Reported	T	124	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	145	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	83150	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	347	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.

Table B-10. Summary of Results from the EcoTox Database for Invertebrates - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	162	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Chromium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	45	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Chromium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	420		NC	ug/L	LAB	1984. Vinot, H., and J.P. Larpent. Water Pollution by Uranium Ore Treatment Works. Hydrobiologia112: 125-129.
Chromium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	22	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Chromium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	48	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Chromium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	90400	NA	NR	ug/L	LAB	1989. Stackhouse, R.A., and W.H. Benson. The Effect of Humic Acid on the Toxicity and Bioavailability of Trivalent Chromium. Ecotoxicol. Environ. Saf.17(1): 105-111.
Chromium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Chromium chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1548	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Chromium chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	98200	NA	NR	ug/L	LAB	1989. Stackhouse, R.A., and W.H. Benson. The Effect of Humic Acid on the Toxicity and Bioavailability of Trivalent Chromium. Ecotoxicol. Environ. Saf.17(1): 105-111.
Chromium chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40507	NR	NR	ug/L	LAB	2000. Guilhermino, L., T. Diamantino, M.C. Silva, and A.M.V.M. Soares. Acute Toxicity Test with Daphnia magna: An Alternative to Mammals in the Prescreening of Chemical Toxicity?. Ecotoxicol. Environ. Saf.46(3): 357-362.
Chromium chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21531	NR	NR	ug/L	LAB	2000. Guilhermino, L., T. Diamantino, M.C. Silva, and A.M.V.M. Soares. Acute Toxicity Test with Daphnia magna: An Alternative to Mammals in the Prescreening of Chemical Toxicity?. Ecotoxicol. Environ. Saf.46(3): 357-362.
Sulfuric acid, Chromium(3+)salt(3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Sulfuric acid, Chromium(3+)salt(3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Nitric acid, Chromium(3+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18630	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nitric acid, Chromium(3+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21600	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nitric acid, Chromium(3+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	22450	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nitric acid, Chromium(3+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	34630	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nitric acid, Chromium(3+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9320	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	1870	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	800	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	580	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	490	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	480	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Chromium(3+)salt(3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	110	NA	NR	ug/L	LAB	1961. Dowden, B.F.. Cumulative Toxicities of Some Inorganic Salts to Daphnia magna as Determined by Median Tolerance Limits. Proc. La. Acad. Sci.23: 77-85.

Table B-10. Summary of Results from the EcoTox Database for Invertebrates - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Chromium(3+)salt(3:2)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	30	NA	NR	ug/L	LAB	1961. Dowden, B.F.. Cumulative Toxicities of Some Inorganic Salts to Daphnia magna as Determined by Median Tolerance Limits. Proc. La. Acad. Sci.23: 77-85.
Chromium	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	700000	NR	NR	ug/L	LAB	1960. Bringmann, G., and R. Kuhn. The Water-Toxicological Detection of Insecticides (Zum Wasser-Toxikologischen Nachweis von Insektiziden). Gesund. -Ing.8: 243-244.
Chromium chloride	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	300	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	162	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	111	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Nitric acid, Chromium(3+) salt	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	283.5	NR	NR	g/g dry f	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Nitric acid, Chromium(3+) salt	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	160	NR	NR	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Chromium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	160		NR	ug/L	LAB	2000. Castillo, G., and L. Schafer. Evaluation of a Bioassay Battery for Water Toxicity Testing: A Chilean Experience. Environ. Toxicol.15(4): 331-337.
Chromium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Munzinger, A., and F. Monicelli. A Comparison of the Sensitivity of Three Daphnia magna Populations Under Chronic Heavy Metal Stress. Ecotoxicol. Environ. Saf.22: 24-31.
Chromium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1992. Munzinger, A., and F. Monicelli. Heavy Metal Co-tolerance in a Chromium Tolerant Strain of Daphnia magna. Aquat. Toxicol.23(3-4): 203-216.
Chromium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1992. Munzinger, A., and F. Monicelli. Heavy Metal Co-tolerance in a Chromium Tolerant Strain of Daphnia magna. Aquat. Toxicol.23(3-4): 203-216.
Chromium	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	5	NA	NR	ug/L	LAB	1992. Munzinger, A., and F. Monicelli. Heavy Metal Co-tolerance in a Chromium Tolerant Strain of Daphnia magna. Aquat. Toxicol.23(3-4): 203-216.
Chromium chloride	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	1500	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Chromium chloride	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	600	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	20	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	37	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	26	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Nitric acid, Chromium(3+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	37.6	NR	NR	g/g dry f	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Nitric acid, Chromium(3+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Chromium oxide (CrO3)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	15	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Chromium chloride	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	700	NA	NR	ug/L	LAB	1989. Kuhn, R., M. Pattard, K.D. Pernak, and A. Winter. Results of the Harmful Effects of Water Pollutants to Daphnia magna in the 21 Day Reproduction Test. Water Res.23(4): 501-510.
Nitric acid, Chromium(3+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Chromium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Santojanni, A., G. Gorbi, and F. Sartore. Prediction of Fecundity in Chronic Toxicity Tests on Daphnia magna. Water Res.32(10): 3146-3156.
Chromium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Gorbi, G., M.G. Corradi, A. Torelli, and M. Bassi. Comparison Between a Normal and a Cr-Tolerant Strain of Scenedesmus acutus as a Food Source to Daphnia magna. Ecotoxicol. Environ. Saf.35(2): 109-111.

Table B-10. Summary of Results from the EcoTox Database for Invertebrates - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1992. Munzinger, A., and F. Monicelli. Heavy Metal Co-tolerance in a Chromium Tolerant Strain of Daphnia magna. Aquat. Toxicol.23(3-4): 203-216.
Chromium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1992. Munzinger, A., and F. Monicelli. Heavy Metal Co-tolerance in a Chromium Tolerant Strain of Daphnia magna. Aquat. Toxicol.23(3-4): 203-216.
Chromium	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	5	NA	NR	ug/L	LAB	1991. Munzinger, A., and F. Monicelli. A Comparison of the Sensitivity of Three Daphnia magna Populations Under Chronic Heavy Metal Stress. Ecotoxicol. Environ. Saf.22: 24-31.
Chromium oxide (CrO3)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	27800	NR	NR	ug/L	LAB	1978. Simonet, D.E., W.I. Knausenberger, L.H.,Jr. Townsend, and E.C.,Jr. Turner. A Biomonitoring Procedure Utilizing Negative Phototaxis of First Instar Aedes aegypti Larvae. Arch. Environ. Contam. Toxicol.7(3): 339-347.
Chromium oxide (CrO3)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	16500	NR	NR	ug/L	LAB	1978. Simonet, D.E., W.I. Knausenberger, L.H.,Jr. Townsend, and E.C.,Jr. Turner. A Biomonitoring Procedure Utilizing Negative Phototaxis of First Instar Aedes aegypti Larvae. Arch. Environ. Contam. Toxicol.7(3): 339-347.
Chromium	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	12500	NA	NR	ug/L	LAB	1988. Abbasi, S.A., P.C. Nipaney, and R. Soni. Studies on Environmental Management of Mercury (II), Chromium (VI) and Zinc (II) with Respect to the Impact on Some Arthropods and Protozoans - Toxicity of Zinc (II). Int. J. Environ. Stud.32: 181-187.

Table B-11. Summary of Results from the EcoTox Database for Invertebrates - Cobalt

Chemical	Common Name	Class	Water Type	Scientific Name	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cobalt	Amphipod	Crustaceans	Fresh	Hyalella azteca	Mortality	LC50		AM	61			ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Cobalt chloride (CoCl2)	Calanoid Copepod	Crustaceans	Fresh	Diaptomus forbesi	Mortality	LC50	Not Reported	T	3440	NR	NR	ug/L	LAB	1994. Das, B.K., and A. Kaviraj. Individual and Interactive Lethal Toxicity of Cadmium, Potassium Permanganate and Cobalt Chloride to Fish, Worm and Plankton. Geobios21(4): 223-227.
Cobalt sulfate	Ciliate	Invertebrates	Fresh	Tetrahymena pyriformis	Mortality	LETC	Not Reported	T	1270*	NA	NR	ug/L	LAB	1973. Carter, J.W., and I.L. Cameron. Toxicity Bioassay of Heavy Metals in Water Using Tetrahymena-pyriformis. Water Res.7(7): 951-961.
Cobalt chloride (CoCl2)	Crayfish	Crustaceans	Fresh	Austropotamobius pallipes ssp. pall	Mortality	LC50*	Not Reported	T	770	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Cobalt chloride (CoCl2)	Crayfish	Crustaceans	Fresh	Austropotamobius pallipes ssp. pall	Mortality	LC50*	Not Reported	T	790	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Cobalt chloride (CoCl2)	Crayfish	Crustaceans	Fresh	Austropotamobius pallipes ssp. pall	Mortality	LC50*	Not Reported	T	8800	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Cobalt chloride (CoCl2)	Crayfish	Crustaceans	Fresh	Orconectes limosus	Mortality	LC50*	Not Reported	T	790	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Cobalt chloride (CoCl2)	Crayfish	Crustaceans	Fresh	Orconectes limosus	Mortality	LC50*	Not Reported	T	880	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Cobalt chloride (CoCl2)	Crayfish	Crustaceans	Fresh	Orconectes limosus	Mortality	LC50*	Not Reported	T	10200	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Cobalt sulfate	Mayfly	Insects/Spiders	Fresh	Ephemerella subvaria	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Cobalt	Midge	Insects/Spiders	Fresh	Chironomus riparius	Mortality	NR-LETH	Not Reported	T	600000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt nitrate	Nematode	Worms	Fresh	Caenorhabditis elegans	Mortality	LC50	Not Reported	T	21.6	L	20.5	mM	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Cobalt chloride (CoCl2)	Nematode	Worms	Fresh	Heterorhabditis bacteriophora	Mortality	NOEC	Not Reported	T	55000	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Cobalt chloride (CoCl2)	Nematode	Worms	Fresh	Heterorhabditis bacteriophora	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Cobalt chloride (CoCl2)	Nematode	Worms	Fresh	Steinernema carpocapsae	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Jaworska, M., J. Sepiol, and P. Tomasik. Effect of Metal Ions Under Laboratory Conditions on the Entomopathogenic Steinernema carpocapsae (Rhabditida: Steinernematidae). Water Air Soil Pollut.88(3-4): 331-341.
Cobalt chloride (CoCl2)	Oligochaete	Worms	Fresh	Branchiura sowerbyi	Mortality	LC50	Not Reported	T	132620	NR	NR	ug/L	LAB	1994. Das, B.K., and A. Kaviraj. Individual and Interactive Lethal Toxicity of Cadmium, Potassium Permanganate and Cobalt Chloride to Fish, Worm and Plankton. Geobios21(4): 223-227.
Cobalt chloride	Pine Wilt Nematode	Worms	Fresh	Bursaphelenchus xylophilus	Mortality	LD50	Not Reported	T	0.000011	NR	NR	M	LAB	1984. Kobamoto, N., and Y. Izumi. The Nematicidal Effect of Metal Ions on the Pine Wood Nematode, Bursaphelenchus xylophilus. J. Pestic. Sci.9(3): 527-529.
Cobalt chloride	Pine Wilt Nematode	Worms	Fresh	Bursaphelenchus xylophilus	Mortality	NR-LETH	Not Reported	T	0.001	NR	NR	M	LAB	1984. Kobamoto, N., and Y. Izumi. The Nematicidal Effect of Metal Ions on the Pine Wood Nematode, Bursaphelenchus xylophilus. J. Pestic. Sci.9(3): 527-529.
Cobalt nitrate	Planarian	Worms	Fresh	Polycelis nigra	Mortality	NR	Not Reported	T	83000	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Cobalt nitrate	Protozoa	Invertebrates	Fresh	Spirostomum ambiguum	Mortality	LC50	Not Reported	T	11800	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Cobalt nitrate	Protozoa	Invertebrates	Fresh	Spirostomum ambiguum	Mortality	LC50	Not Reported	T	10600	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.

Table B-11. Summary of Results from the EcoTox Database for Invertebrates - Cobalt

Chemical	Common Name	Class	Water Type	Scientific Name	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cobalt	Quiver Fly	Insects/Spiders	Fresh	Anabolia nervosa	Mortality	NR-LETH	Not Reported	T	400000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Scud	Crustaceans	Fresh	Hyalella azteca	Mortality	LC50	Not Reported	T	16	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Cobalt	Scud	Crustaceans	Fresh	Hyalella azteca	Mortality	LC50	Not Reported	T	61	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Cobalt	Scud	Crustaceans	Fresh	Gammarus roeseli	Mortality	NR-LETH	Not Reported	T	8000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt nitrate	Snail	Molluscs	Fresh	Bulinus globosus	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Cobalt nitrate	Snail	Molluscs	Fresh	Bulinus globosus	Mortality	NR-ZERO	Not Reported	T	10000	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	388900		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	488050		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	525810		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	615930		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	202990		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	272590		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	350420		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	484760		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	133590		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	188150		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	239390		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	247230		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	179710		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	239390		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	247230		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	EC50	Not Reported	T	95350		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.

Table B-11. Summary of Results from the EcoTox Database for Invertebrates - Cobalt

Chemical	Common Name	Class	Water Type	Scientific Name	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cobalt	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	NR-LETH	Not Reported	T	400000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	NR-ZERO	Not Reported	T	56000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	NR-ZERO	Not Reported	T	100000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt chloride (CoCl2)	Tubificid Worm	Worms	Fresh	Tubifex tubifex	Mortality	NR-ZERO	Not Reported	T	180000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Cobalt nitrate	Turbellarian, Flatworm	Worms	Fresh	Dugesia tigrina	Growth	NR		T	NR	NA	NR	ug/L	LAB	1987. Solski, A., and M. Piontek. The Use of the Planarian Dugesia tigrina Girard for the Assessment of Chronic intoxications. Pol. Arch. Hydrobiol.34(4): 543-550.
Cobalt chloride (CoCl2)	Turbellarian, Flatworm	Worms	Fresh	Dugesia tigrina	Mortality	LC50	Not Reported	T	12000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Cobalt nitrate	Turbellarian, Flatworm	Worms	Fresh	Dugesia tigrina	Mortality	LC50	Not Reported	T	707*	NA	NR	ug/L	LAB	1987. Solski, A., and M. Piontek. The Use of the Planarian Dugesia tigrina Girard for the Assessment of Chronic intoxications. Pol. Arch. Hydrobiol.34(4): 543-550.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Ceriodaphnia dubia	Mortality	LC50	Not Reported	T	2347.2	NA	NR	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, W.J. Rasnake, J.K. Fanelli, and D. Gruber. Toxicity of Cobalt to Freshwater Indicator Species as a Function of Water Hardness. Aquat. Toxicol.22(3): 163-180.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Ceriodaphnia dubia	Mortality	LC50	Not Reported	T	4196	NA	NR	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, W.J. Rasnake, J.K. Fanelli, and D. Gruber. Toxicity of Cobalt to Freshwater Indicator Species as a Function of Water Hardness. Aquat. Toxicol.22(3): 163-180.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Ceriodaphnia dubia	Mortality	LC50	Not Reported	T	4595.7	NA	NR	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, W.J. Rasnake, J.K. Fanelli, and D. Gruber. Toxicity of Cobalt to Freshwater Indicator Species as a Function of Water Hardness. Aquat. Toxicol.22(3): 163-180.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Ceriodaphnia dubia	Mortality	LC50	Not Reported	D	1670	NR	NR	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Ceriodaphnia dubia	Mortality	LC50	Not Reported	T	94660	NR	NR	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Daphnia hyalina	Mortality	LC50	Not Reported	T	1320	NA	NR	ug/L	LAB	1974. Baudouin, M.F., and P. Scoppa. Acute Toxicity of Various Metals to Freshwater Zooplankton. Bull. Environ. Contam. Toxicol.12(6): 745-751.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	2110	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	1520	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	1500*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Daphnia pulex	Mortality	LC50	Not Reported	D	9720	NR	NR	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	5150	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	6830	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	7370	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	7370	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	27	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	1860	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..

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Chemical	Common Name	Class	Water Type	Scientific Name	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	1860	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia pulicaria	Mortality	LC50	Not Reported	T	1498	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia pulicaria	Mortality	LC50	Not Reported	T	1619	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia pulicaria	Mortality	LC50	Not Reported	T	1765	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia pulicaria	Mortality	LC50	Not Reported	T	2380	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia pulicaria	Mortality	LC50	Not Reported	T	3037	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia pulicaria	Mortality	LC50	Not Reported	T	397	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia pulicaria	Mortality	LC50	Not Reported	T	524	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia pulicaria	Mortality	LC50	Not Reported	T	689	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Cobalt nitrate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	5800	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Cobalt nitrate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50	Not Reported	T	3400	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50*	Not Reported	T	16800	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50*	Not Reported	T	5500	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50*	Not Reported	T	3700	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50*	Not Reported	T	1700	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50*	Not Reported	T	1000	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50*	Not Reported	T	19600	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50*	Not Reported	T	6000	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50*	Not Reported	T	4600	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50*	Not Reported	T	3400	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LC50*	Not Reported	T	2700	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.

Table B-11. Summary of Results from the EcoTox Database for Invertebrates - Cobalt

Chemical	Common Name	Class	Water Type	Scientific Name	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cobalt	Water Flea	Crustaceans	Fresh	Daphnia sp.	Mortality	LD50	Not Reported	T	100000	NR	NR	ug/L	LAB	1960. Bringmann, G., and R. Kuhn. The Water-Toxicological Detection of Insecticides (Zum Wasser-Toxikologischen Nachweis von Insektiziden). Gesund. -Ing.8: 243-244.
Cobalt nitrate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	LD50	Not Reported	T	2300	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Ceriodaphnia dubia	Mortality	NOEC	Not Reported	T	50	NA	NR	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, W.J. Rasnake, J.K. Fanelli, and D. Gruber. Toxicity of Cobalt to Freshwater Indicator Species as a Function of Water Hardness. Aquat. Toxicol.22(3): 163-180.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Ceriodaphnia dubia	Mortality	NOEC	Not Reported	T	600	NA	NR	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, W.J. Rasnake, J.K. Fanelli, and D. Gruber. Toxicity of Cobalt to Freshwater Indicator Species as a Function of Water Hardness. Aquat. Toxicol.22(3): 163-180.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	NR	Not Reported	T	179	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	NR-LETH	Not Reported	T	51900	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	NR-ZERO	Not Reported	T	87	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt nitrate	Water Flea	Crustaceans	Fresh	Daphnia magna	Mortality	NR-ZERO	Not Reported	T	4500	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Cobalt chloride (CoCl2)	Water Flea	Crustaceans	Fresh	Daphnia magna	Reproductio	EC50*		T	12	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Reproductio	LOEC	Not Reported	T	9.3	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Reproductio	LOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Reproductio	MATC	Not Reported	T	5.1	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Reproductio	MATC	Not Reported	T	14	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Reproductio	NOEC	Not Reported	T	2.8	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Reproductio	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Water Flea	Crustaceans	Fresh	Daphnia magna	Reproductio	NR	Not Reported	T	5.2	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	American Lobster	Crustaceans	NR	Growth	NR	Not Reported	T	1600000	NA	NR	ug/L	LAB	1985. Kean, J.C., J.D. Castell, E.W. Pass, and C.L. Chou. Feeding Trials with Juveniles of the American Lobster Homarus americanus Milne-Edwards Using Various Levels of Dietary Ascorbic Acid and Copper. J. Shellfish Res.5(1): 38.
Copper	American Lobster	Crustaceans	NR	Mortality	NR	Not Reported	T	1600000	NA	NR	ug/L	LAB	1985. Kean, J.C., J.D. Castell, E.W. Pass, and C.L. Chou. Feeding Trials with Juveniles of the American Lobster Homarus americanus Milne-Edwards Using Various Levels of Dietary Ascorbic Acid and Copper. J. Shellfish Res.5(1): 38.
Sulfuric acid copper(2+) salt (1:1)	Amoeba	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Amoeba	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	2400	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Copper chloride	Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	590	NA	NR	ug/L	LAB	1997. Pantani, C., G. Pannunzio, M. De Cristofaro, A.A. Novelli, and M. Salvatori. Comparative Acute Toxicity of Some Pesticides, Metals, and Surfactants to Gammarus italicus Goedm. and Echinogammarus tibaldii Pink. and Stock (Crustacea: Amphipoda). Bull. Environ. Contam. Toxicol.59(6): 963-967.
Copper chloride (CuCl2)	Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1400	NR	NR	ug/L	LAB	1995. Pantani, C., N. Spreti, A.A. Novelli, A.V. Ghirardini, and P.F. Ghetti. Effect of Particulate Matter on Copper and Surfactants Acute Toxicity to Echinogammarus tibaldii (Crustacea, Amphipoda). Environ. Technol.16(3): 263-270.
Copper chloride (CuCl2)	Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3000	NR	NR	ug/L	LAB	1995. Pantani, C., N. Spreti, A.A. Novelli, A.V. Ghirardini, and P.F. Ghetti. Effect of Particulate Matter on Copper and Surfactants Acute Toxicity to Echinogammarus tibaldii (Crustacea, Amphipoda). Environ. Technol.16(3): 263-270.
Copper chloride (CuCl2)	Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6100	NR	NR	ug/L	LAB	1995. Pantani, C., N. Spreti, A.A. Novelli, A.V. Ghirardini, and P.F. Ghetti. Effect of Particulate Matter on Copper and Surfactants Acute Toxicity to Echinogammarus tibaldii (Crustacea, Amphipoda). Environ. Technol.16(3): 263-270.
Copper chloride (CuCl2)	Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	720	NR	NR	ug/L	LAB	1995. Pantani, C., N. Spreti, A.A. Novelli, A.V. Ghirardini, and P.F. Ghetti. Effect of Particulate Matter on Copper and Surfactants Acute Toxicity to Echinogammarus tibaldii (Crustacea, Amphipoda). Environ. Technol.16(3): 263-270.
Copper chloride (CuCl2)	Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8200	NR	NR	ug/L	LAB	1995. Pantani, C., N. Spreti, A.A. Novelli, A.V. Ghirardini, and P.F. Ghetti. Effect of Particulate Matter on Copper and Surfactants Acute Toxicity to Echinogammarus tibaldii (Crustacea, Amphipoda). Environ. Technol.16(3): 263-270.
Copper chloride (CuCl2)	Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9600	NR	NR	ug/L	LAB	1995. Pantani, C., N. Spreti, A.A. Novelli, A.V. Ghirardini, and P.F. Ghetti. Effect of Particulate Matter on Copper and Surfactants Acute Toxicity to Echinogammarus tibaldii (Crustacea, Amphipoda). Environ. Technol.16(3): 263-270.
Copper	Amphipod	Crustaceans	Fresh	Mortality	LC50		AM	90			ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to *Hyalella azteca* at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Copper chloride (CuCl2)	Apple Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Copper chloride (CuCl2)	Apple Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Copper chloride (CuCl2)	Apple Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Copper chloride (CuCl2)	Apple Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Copper chloride (CuCl2)	Aquatic Sowbug	Crustaceans	NR	Growth	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1988. De Nicola Guidici, M., and L. Migliore. Long Term Effect of Cadmium or Copper on Asellus aquaticus (L.) (Crustacea, Isopoda). Ver. Int. Verh. Limnol.23(3): 1660-1662.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Growth	NR		T	1.80*	NA	NR	ug/L	LAB	1987. De Nicola Guidici, M., L. Migliore, and S.M. Guarino. Sensitivity of Asellus aquaticus (L.) and Proasellus coxalis Dollf. (Crustacea, Isopoda) to Copper. Hydrobiologia146: 63-69.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	32080*	NA	NR	ug/L	LAB	1979. Furmanska, M.. Studies of the Effect of Copper, Zinc, and Iron on the Biotic Components of Aquatic Ecosystems. Pol. Arch. Hydrobiol.26(1-2): 213-220.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	10000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	150000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	10	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Copper chloride (CuCl2)	Aquatic Sowbug	Crustaceans	NR	Mortality	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1988. De Nicola Guidici, M., and L. Migliore. Long Term Effect of Cadmium or Copper on Asellus aquaticus (L.) (Crustacea, Isopoda). Ver. Int. Verh. Limnol.23(3): 1660-1662.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1.80*	NA	NR	ug/L	LAB	1987. De Nicola Guidici, M., L. Migliore, and S.M. Guarino. Sensitivity of Asellus aquaticus (L.) and Proasellus coxalis Dollf. (Crustacea, Isopoda) to Copper. Hydrobiologia146: 63-69.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1988. De Nicola Giudici, M., L. Migliore, C. Gambardella, and A. Marotta. Effect of Chronic Exposure to Cadmium and Copper on Asellus aquaticus (L.) (Crustacea, Isopoda). Hydrobiologia157(3): 265-269.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	150000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Copper chloride (CuCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	98	NR	NR	ug/L	LAB	2006. Bouskill, N.J., R.D. Handy, T.E. Ford, and T.S. Galloway. Differentiating Copper and Arsenic Toxicity Using Biochemical Biomarkers in Asellus aquaticus and Dreissena polymorpha. Ecotoxicol. Environ. Saf.65(3): 342-349.
Copper chloride (CuCl2)	Aquatic Sowbug	Crustaceans	NR	Reproduction	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1988. De Nicola Guidici, M., and L. Migliore. Long Term Effect of Cadmium or Copper on Asellus aquaticus (L.) (Crustacea, Isopoda). Ver. Int. Verh. Limnol.23(3): 1660-1662.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Reproduction	NR		T	5	NA	NR	ug/L	LAB	1988. De Nicola Giudici, M., L. Migliore, C. Gambardella, and A. Marotta. Effect of Chronic Exposure to Cadmium and Copper on Asellus aquaticus (L.) (Crustacea, Isopoda). Hydrobiologia157(3): 265-269.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Reproduction	NR		T	5	NA	NR	ug/L	LAB	1988. De Nicola Giudici, M., L. Migliore, C. Gambardella, and A. Marotta. Effect of Chronic Exposure to Cadmium and Copper on Asellus aquaticus (L.) (Crustacea, Isopoda). Hydrobiologia157(3): 265-269.
Sulfuric acid copper(2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Reproduction	NR		T	5	NA	NR	ug/L	LAB	1988. De Nicola Giudici, M., L. Migliore, C. Gambardella, and A. Marotta. Effect of Chronic Exposure to Cadmium and Copper on Asellus aquaticus (L.) (Crustacea, Isopoda). Hydrobiologia157(3): 265-269.
Copper chloride (CuCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	28	NA	NR	ug/L	LAB	1981. Harrison, F.L., J.P. Knezovich, and D.W.,Jr. Rice. Effects of Copper on Adult and Early Life Stages of the Freshwater Clam, Corbicula manilensis. UCRL-52741, U.S.Nuclear Regulatory Commission, Lawrence Livermore National Laboratory, Livermore, CA: 34 p..
Copper chloride (CuCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	28	NA	NR	ug/L	LAB	1984. Harrison, F.L., J.P. Knezovich, and D.W.,Jr. Rice. The Toxicity of Copper to the Adult and Early Life Stages of the Freshwater Clam, Corbicula manilensis. Arch. Environ. Contam. Toxicol.13(1): 85-92.
Copper chloride (CuCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1981. Harrison, F.L., J.P. Knezovich, and D.W.,Jr. Rice. Effects of Copper on Adult and Early Life Stages of the Freshwater Clam, Corbicula manilensis. UCRL-52741, U.S.Nuclear Regulatory Commission, Lawrence Livermore National Laboratory, Livermore, CA: 34 p..
Copper chloride (CuCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1984. Harrison, F.L., J.P. Knezovich, and D.W.,Jr. Rice. The Toxicity of Copper to the Adult and Early Life Stages of the Freshwater Clam, Corbicula manilensis. Arch. Environ. Contam. Toxicol.13(1): 85-92.
Copper chloride (CuCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	825	NA	NR	ug/L	LAB	1981. Harrison, F.L., J.P. Knezovich, and D.W.,Jr. Rice. Effects of Copper on Adult and Early Life Stages of the Freshwater Clam, Corbicula manilensis. UCRL-52741, U.S.Nuclear Regulatory Commission, Lawrence Livermore National Laboratory, Livermore, CA: 34 p..
Copper chloride (CuCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	122	NA	NR	ug/L	LAB	1981. Harrison, F.L., J.P. Knezovich, and D.W.,Jr. Rice. Effects of Copper on Adult and Early Life Stages of the Freshwater Clam, Corbicula manilensis. UCRL-52741, U.S.Nuclear Regulatory Commission, Lawrence Livermore National Laboratory, Livermore, CA: 34 p..
Copper chloride (CuCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	38	NA	NR	ug/L	LAB	1981. Harrison, F.L., J.P. Knezovich, and D.W.,Jr. Rice. Effects of Copper on Adult and Early Life Stages of the Freshwater Clam, Corbicula manilensis. UCRL-52741, U.S.Nuclear Regulatory Commission, Lawrence Livermore National Laboratory, Livermore, CA: 34 p..
Copper chloride (CuCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	12	NA	NR	ug/L	LAB	1981. Harrison, F.L., J.P. Knezovich, and D.W.,Jr. Rice. Effects of Copper on Adult and Early Life Stages of the Freshwater Clam, Corbicula manilensis. UCRL-52741, U.S.Nuclear Regulatory Commission, Lawrence Livermore National Laboratory, Livermore, CA: 34 p..
Copper chloride (CuCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3638	NA	NR	ug/L	LAB	1981. Harrison, F.L., J.P. Knezovich, and D.W.,Jr. Rice. Effects of Copper on Adult and Early Life Stages of the Freshwater Clam, Corbicula manilensis. UCRL-52741, U.S.Nuclear Regulatory Commission, Lawrence Livermore National Laboratory, Livermore, CA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	590	NA	NR	ug/L	LAB	1980. Cherry, D.S., J.H.,Jr. Rodgers, R.L. Graney, and J.,Jr. Cairns. Dynamics and Control of the Asiatic Clam in the New River, Virginia. Bull. Va. Water Resour. Res. Ctr.123: 72 p..
Sulfuric acid copper(2+) salt (1:1)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1125000	NA	NR	ug/L	LAB	1979. Chandler, J.H.,Jr., and L.L. Marking. Toxicity of Fishery Chemicals to the Asiatic Clam, Corbicula manilensis. Prog. Fish-Cult.41(3): 148-151.
Sulfuric acid copper(2+) salt (1:1)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	490	NA	NR	ug/L	LAB	1980. Cherry, D.S., J.H.,Jr. Rodgers, R.L. Graney, and J.,Jr. Cairns. Dynamics and Control of the Asiatic Clam in the New River, Virginia. Bull. Va. Water Resour. Res. Ctr.123: 72 p..
Sulfuric acid copper(2+) salt (1:1)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1980. Cherry, D.S., J.H.,Jr. Rodgers, R.L. Graney, and J.,Jr. Cairns. Dynamics and Control of the Asiatic Clam in the New River, Virginia. Bull. Va. Water Resour. Res. Ctr.123: 72 p..
Sulfuric acid copper(2+) salt (1:1)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	670000	NA	NR	ug/L	LAB	1979. Chandler, J.H.,Jr., and L.L. Marking. Toxicity of Fishery Chemicals to the Asiatic Clam, Corbicula manilensis. Prog. Fish-Cult.41(3): 148-151.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. Harrison, F.L., J.P. Knezovich, and D.W.,Jr. Rice. The Toxicity of Copper to the Adult and Early Life Stages of the Freshwater Clam, Corbicula manilensis. Arch. Environ. Contam. Toxicol.13(1): 85-92.
Copper chloride (CuCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5	NA	NR	ug/L	LAB	1981. Harrison, F.L., J.P. Knezovich, and D.W.,Jr. Rice. Effects of Copper on Adult and Early Life Stages of the Freshwater Clam, Corbicula manilensis. UCRL-52741, U.S.Nuclear Regulatory Commission, Lawrence Livermore National Laboratory, Livermore, CA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Pigtoe	Molluscs	Fresh	Mortality	LC50	Not Reported	T	20.22	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Pigtoe	Molluscs	Fresh	Mortality	LC50	Not Reported	T	58.4	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Backswimmer Family	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	260	NA	NR	ug/L	FIELDN	1996. Shaw, J.L., and J.P. Manning. Evaluating Macroinvertebrate Population and Community Level Effects in Outdoor Microcosms: Use of In Situ Bioassays and Multivariate Analysis. Environ. Toxicol. Chem.15(5): 608-617.
Sulfuric acid copper(2+) salt (1:1)	Backswimmer Family	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	260	NA	NR	ug/L	FIELDN	1996. Shaw, J.L., and J.P. Manning. Evaluating Macroinvertebrate Population and Community Level Effects in Outdoor Microcosms: Use of In Situ Bioassays and Multivariate Analysis. Environ. Toxicol. Chem.15(5): 608-617.
Copper chloride (CuCl2)	Balthica Macoma Or Clam	Molluscs	Fresh	Growth	NOEL	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Hummel, H., P. Magni, C. Amiard-Triquet, F. Rainglet, R. Modderman, Y. Van Duijn, M. Herssevoort, J. De Jong, L. Snitsev. Influence of the Level of Oxygenation in Sediment and Water on Copper Bioavailability to Marine Bivalves: Laboratory Experiments and Translocation Experiments in the Field. Hydrobiologia373-374(1-3): 297-310.
Copper chloride (CuCl2)	Balthica Macoma Or Clam	Molluscs	Fresh	Growth	NOEL	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Hummel, H., P. Magni, C. Amiard-Triquet, F. Rainglet, R. Modderman, Y. Van Duijn, M. Herssevoort, J. De Jong, L. Snitsev. Influence of the Level of Oxygenation in Sediment and Water on Copper Bioavailability to Marine Bivalves: Laboratory Experiments and Translocation Experiments in the Field. Hydrobiologia373-374(1-3): 297-310.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Growth	LOEL	Whole Organism	T	50000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Growth	NOEL	Whole Organism	T	10000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Growth	NR	Whole Organism	T	100000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Growth	NR	Whole Organism	T	100000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Growth	NR	Whole Organism	T	100000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Growth	NR	Whole Organism	T	100000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Growth	NR	Whole Organism	T	100000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	3480		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	520		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1690		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	380		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1370		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	280		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid copper(2+) salt (1:1)	Big Claw River Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1987. Correa, M.. Physiological Effects of Metal Toxicity on the Tropical Freshwater Shrimp Macrobrachium carcinus (Linneo, 1758). Environ. Pollut.45(2): 149-155.
Sulfuric acid copper(2+) salt (1:1)	Big-Eared Radix	Molluscs	Fresh	Mortality	NR	Not Reported	T	125	NR	NR	ug/L	LAB	1988. Khajuria, J.K., and H.S. Bali. Evaluation of Three Molluscicides Against Limnaea auricularia var rufescens in Laboratory. Cheiron17(2): 61-63.
Sulfuric acid copper(2+) salt (1:1)	Big-Eared Radix	Molluscs	Fresh	Mortality	NR	Not Reported	T	125	NR	NR	ug/L	LAB	1988. Khajuria, J.K., and H.S. Bali. Evaluation of Three Molluscicides Against Limnaea auricularia var rufescens in Laboratory. Cheiron17(2): 61-63.
Sulfuric acid copper(2+) salt (1:1)	Big-Eared Radix	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1988. Khajuria, J.K., and H.S. Bali. Evaluation of Three Molluscicides Against Limnaea auricularia var rufescens in Laboratory. Cheiron17(2): 61-63.
Sulfuric acid copper(2+) salt (1:1)	Big-Eared Radix	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1988. Khajuria, J.K., and H.S. Bali. Evaluation of Three Molluscicides Against Limnaea auricularia var rufescens in Laboratory. Cheiron17(2): 61-63.
Sulfuric acid copper(2+) salt (1:1)	Big-Eared Radix	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1988. Khajuria, J.K., and H.S. Bali. Evaluation of Three Molluscicides Against Limnaea auricularia var rufescens in Laboratory. Cheiron17(2): 61-63.
Sulfuric acid copper(2+) salt (1:1)	Big-Eared Radix	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1988. Khajuria, J.K., and H.S. Bali. Evaluation of Three Molluscicides Against Limnaea auricularia var rufescens in Laboratory. Cheiron17(2): 61-63.
Sulfuric acid copper(2+) salt (1:1)	Big-Eared Radix	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	500	NR	NR	ug/L	LAB	1988. Khajuria, J.K., and H.S. Bali. Evaluation of Three Molluscicides Against Limnaea auricularia var rufescens in Laboratory. Cheiron17(2): 61-63.
Sulfuric acid copper(2+) salt (1:1)	Big-Eared Radix	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	500	NR	NR	ug/L	LAB	1988. Khajuria, J.K., and H.S. Bali. Evaluation of Three Molluscicides Against Limnaea auricularia var rufescens in Laboratory. Cheiron17(2): 61-63.
Sulfuric acid copper(2+) salt (1:1)	Big-Eared Radix	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	LAB	1988. Khajuria, J.K., and H.S. Bali. Evaluation of Three Molluscicides Against Limnaea auricularia var rufescens in Laboratory. Cheiron17(2): 61-63.
Sulfuric acid copper(2+) salt (1:1)	Big-Eared Radix	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	LAB	1988. Khajuria, J.K., and H.S. Bali. Evaluation of Three Molluscicides Against Limnaea auricularia var rufescens in Laboratory. Cheiron17(2): 61-63.
Sulfuric acid copper(2+) salt (1:1)	Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1977. Lakshmanan, P.T., and P.N.K. Nambisan. Toxicity of Copper on the Bivalve Villorita cyprinoides var. cochinensis. Indian J. Mar. Sci.6(1): 83-85.
Sulfuric acid copper(2+) salt (1:1)	Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1.214	NA	NR	ug/L	LAB	1986. Abraham, T.J., K.Y.M. Salih, and J. Chacko. Effects of Heavy Metals on the Filtration Rate of Bivalve Villorita cyprinoides (Hanley) var. cochinensis. Indian J. Mar. Sci.15(3): 195-196.
Copper	Bivalve	Molluscs	NR	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Chen, J.. Effects of Cu2+ of Larval Development of Sinonov acula constricta and Detoxification of EDTA. J. Oceanogr. Taiwan Strait/Taiwan Haixia8(3): 242-246.
Sulfuric acid copper(2+) salt (1:1)	Bivalve	Molluscs	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1977. Lakshmanan, P.T., and P.N.K. Nambisan. Toxicity of Copper on the Bivalve Villorita cyprinoides var. cochinensis. Indian J. Mar. Sci.6(1): 83-85.
Sulfuric acid copper(2+) salt (1:1)	Black Currant Nematode	Worms	Fresh	Mortality	LOEL	Not Reported	T	10000		NC	ug/L	LAB	1972. Pitcher, R.S., and D.G. McNamara. The Toxicity of Low Concentrations of Silver and Cupric Ions to Three Species of Plant-Parasitic Nematodes. Nematologica18: 385-390.
Sulfuric acid copper(2+) salt (1:1)	Black Currant Nematode	Worms	Fresh	Mortality	NOEL	Not Reported	T	1000		NC	ug/L	LAB	1972. Pitcher, R.S., and D.G. McNamara. The Toxicity of Low Concentrations of Silver and Cupric Ions to Three Species of Plant-Parasitic Nematodes. Nematologica18: 385-390.
Sulfuric acid copper(2+) salt (1:1)	Black Sandshell	Molluscs	Fresh	Mortality	EC50	Not Reported	D	34.8	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Bladder Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2004. Morley, N.J., K.M.Y. Leung, D. Morritt, and M. Crane. Toxicity of Anti-Fouling Biocides to Encysted Metacercariae of Echinoparyphium recurvatum (Digenea: Echinostomatidae) and Their Snail Hosts. Chemosphere56(4): 353-358.
Nitric acid, Copper(2+) salt	Brown Gardensnail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Laskowski, R., and S.P. Hopkin. Effect of Zn, Cu, Pb and Cd on Fitness in Snails (Helix aspersa). Ecotoxicol. Environ. Saf.34(1): 59-69.
Nitric acid, Copper(2+) salt	Brown Gardensnail	Molluscs	Fresh	Reproduction	EC50	Not Reported	T	1050000	NR	NR	ug/L	LAB	1996. Laskowski, R., and S.P. Hopkin. Effect of Zn, Cu, Pb and Cd on Fitness in Snails (Helix aspersa). Ecotoxicol. Environ. Saf.34(1): 59-69.
Sulfuric acid copper(2+) salt (1:1)	Brown Mystery Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1970. Arthur, J.W., and E.N. Leonard. Effects of Copper on Gammarus pseudolimnaeus, Physa integra, and Campeloma decisum in Soft Water. J. Fish. Res. Board Can.27(7): 1277-1283.
Sulfuric acid copper(2+) salt (1:1)	Brown Mystery Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1970. Arthur, J.W., and E.N. Leonard. Effects of Copper on Gammarus pseudolimnaeus, Physa integra, and Campeloma decisum in Soft Water. J. Fish. Res. Board Can.27(7): 1277-1283.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Growth	IC50	Not Reported	T	160	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Growth	IC50	Not Reported	T	160	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Growth	IC50	Not Reported	T	80	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Growth	IC50	Not Reported	T	90	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Growth	IC50	Not Reported	T	90	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Growth	IC50	Not Reported	T	90	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Growth	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Growth	LOEC	Not Reported	T	200	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Growth	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Growth	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	370		NC	ug/L	LAB	1998. Safadi, R.S.. The Use of Freshwater Planarians in Acute Toxicity Tests with Heavy Metals. Verh. Int. Ver. Limnol.26(5): 2391-2392.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	270	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	460	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	560	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	620	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	760	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	190	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	330	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	360	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	540	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	330	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	470	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	540	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	590	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	140	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	330	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	440	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	480	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	530	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	590	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Reproduction	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Sulfuric acid copper(2+) salt (1:1)	Brown Planaria	Worms	Fresh	Reproduction	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2008. Knakievicz, T., and H.B. Ferreira. Evaluation of Copper Effects upon Girardia tigrina Freshwater Planarians Based on a Set of Biomarkers. Chemosphere71(3): 419-428.
Copper	Bryozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	510	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Copper	Bryozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Copper	Bryozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Copper chloride (CuCl2)	Caddisfly	Insects/Spiders	Fresh	Mortality	LC10	Not Reported	T	38		NC	ug/L	LAB	2000. Van der Geest, H.G., G.D. Greve, A. Kroon, S. Kuijl, M.H.S. Kraak, and W. Admiraal. Sensitivity of Characteristic Riverine Insects, the Caddisfly Cyrnus trimaculatus and the Mayfly Ephoron virgo, to Copper and Diazinon. Environ. Pollut.109: 177-182.
Copper chloride (CuCl2)	Caddisfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	759		NC	ug/L	LAB	2000. Van der Geest, H.G., G.D. Greve, A. Kroon, S. Kuijl, M.H.S. Kraak, and W. Admiraal. Sensitivity of Characteristic Riverine Insects, the Caddisfly Cyrnus trimaculatus and the Mayfly Ephoron virgo, to Copper and Diazinon. Environ. Pollut.109: 177-182.
Copper chloride (CuCl2)	Caddisfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2510	NR	NR	ug/L	LAB	1999. Van der Geest, H.G., G.D. Greve, E.M. De Haas, B.B. Scheper, M.H.S. Kraak, S.C. Stuijfzand, K.H. Augustijn, and W. Admir. Survival and Behavioral Responses of Larvae of the Caddisfly Hydropsyche angustipennis to Copper and Diazinon. Environ. Toxicol. Chem.18(9): 1965-1971.
Copper chloride (CuCl2)	Caddisfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	350	NR	NR	ug/L	LAB	1999. Van der Geest, H.G., G.D. Greve, E.M. De Haas, B.B. Scheper, M.H.S. Kraak, S.C. Stuijfzand, K.H. Augustijn, and W. Admir. Survival and Behavioral Responses of Larvae of the Caddisfly Hydropsyche angustipennis to Copper and Diazinon. Environ. Toxicol. Chem.18(9): 1965-1971.
Copper chloride (CuCl2)	Caddisfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	502	NR	NR	ug/L	LAB	1999. Van der Geest, H.G., G.D. Greve, E.M. De Haas, B.B. Scheper, M.H.S. Kraak, S.C. Stuijfzand, K.H. Augustijn, and W. Admir. Survival and Behavioral Responses of Larvae of the Caddisfly Hydropsyche angustipennis to Copper and Diazinon. Environ. Toxicol. Chem.18(9): 1965-1971.
Copper	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	12100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Copper	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	6200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Copper chloride (CuCl2)	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	71	NR	NR	ug/L	LAB	2008. Hall, L.W.,Jr., R.D. Anderson, B.L. Lewis, and W.R. Arnold. The Influence of Salinity and Dissolved Organic Carbon on the Toxicity of Copper to the Estuarine Copepod, Eurytemora affinis. Arch. Environ. Contam. Toxicol.54(1): 44-56.
Copper	Chiton	Molluscs	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1993. Tyurin, A.N., and N.K. Khristoforova. Effect of Toxicants on the Development of the Chiton Ischnochiton hakodadensis. Russ.J.Mar.Biol.19(5/6):100-106 / Biol.Morya5-6: 100-106.
Copper	Chiton	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	100	NA	NR	ug/L	LAB	1993. Tyurin, A.N., and N.K. Khristoforova. Effect of Toxicants on the Development of the Chiton Ischnochiton hakodadensis. Russ.J.Mar.Biol.19(5/6):100-106 / Biol.Morya5-6: 100-106.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Growth	EC50*		T	1.6	NA	NR	ug/L	LAB	1990. Roberts, S., P. Vasseur, and D. Dive. Combined Effects Between Atrazine, Copper and pH, on Target and Non Target Species. Water Res.24(4): 485-491.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Growth	EC50*		T	1.7	NA	NR	ug/L	LAB	1990. Roberts, S., P. Vasseur, and D. Dive. Combined Effects Between Atrazine, Copper and pH, on Target and Non Target Species. Water Res.24(4): 485-491.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Growth	NR		T	20000	NA	NR	ug/L	LAB	1979. Bovee, E.C., D.A. Kegley, D. Sternshein, E. Wyttenbach, and B.L. Bergquist. Alleviation of the Toxicity of Copper to Tetrahymena pyriformis by Nontoxic Iron. Univ.Kans.Sci.Bull.51(24): 679-684.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1820	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	390	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	12	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	170	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1450	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	10.5	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2050	NR	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1994. Gracia, M.P., H. Salvado, M. Rius, and J.M. Amigo. Effects of Copper on Ciliate Communities from Activated Sludge Plants. Acta Protozool.33(4): 219-226.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	450	NA	NR	ug/L	LAB	1994. Gracia, M.P., H. Salvado, M. Rius, and J.M. Amigo. Effects of Copper on Ciliate Communities from Activated Sludge Plants. Acta Protozool.33(4): 219-226.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	82	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	95	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	55	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	74	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	124	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	51	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	57	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	96	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	47	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	49	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	77	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	96	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	31	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	39	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	41	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	25	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	27	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	56	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	46	NR	NR	ug/L	LAB	2009. Straus, D.L., M.M. Hossain, and T.G. Clark. Copper Sulfate Toxicity to Two Isolates of Ichthyophthirius multifiliis Relative to Alkalinity. Dis. Aquat. Org.83(1): 31-36.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	112	NR	NR	ug/L	LAB	1993. Roberts, R.O., and S.G. Berk. Effect of Copper, Herbicides, and a Mixed Effluent of Chemoattraction of Tetrahymena pyriformis. Environ. Toxicol. Water Qual.8(1): 73-85.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1994. Gracia, M.P., H. Salvado, M. Rius, and J.M. Amigo. Effects of Copper on Ciliate Communities from Activated Sludge Plants. Acta Protozool.33(4): 219-226.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	38000	NA	NR	ug/L	LAB	1994. Gracia, M.P., H. Salvado, M. Rius, and J.M. Amigo. Effects of Copper on Ciliate Communities from Activated Sludge Plants. Acta Protozool.33(4): 219-226.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1994. Gracia, M.P., H. Salvado, M. Rius, and J.M. Amigo. Effects of Copper on Ciliate Communities from Activated Sludge Plants. Acta Protozool.33(4): 219-226.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1994. Gracia, M.P., H. Salvado, M. Rius, and J.M. Amigo. Effects of Copper on Ciliate Communities from Activated Sludge Plants. Acta Protozool.33(4): 219-226.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LC50*	Not Reported	T	1800	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	NR	Not Reported	T	34	L	0.9	ug	LAB	2009. Nogueira, P.F.M., M.G.G. Melao, A.T. Lombardi, and M.M. Nogueira. Natural DOM Affects Copper Speciation and Bioavailability to Bacteria and Ciliate. Arch. Environ. Contam. Toxicol.57(2): 274-281.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	1999. Nicolau, A., M. Mota, and N. Lima. Physiological Responses of Tetrahymena pyriformis to Copper, Zinc, Cycloheximide and Triton X-100. FEMS (Fed. Eur. Microbiol. Soc.) Microbiol. Ecol.30: 209-216.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Ling, K.H., Y.M. Sin, and T.J. Lam. Effect of Copper Sulphate on Ichthyophthiriasis (White Spot Disease) in Goldfish (Carassius auratus). Aquaculture118(1-2): 23-35.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Doucet, C.M., and E.J. Maly. Effect of Copper on the Interaction Between the Predator Didinium nasutum and Its Prey Paramecium caudatum. Can. J. Fish. Aquat. Sci.47(6): 1122-1127.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR	Not Reported	T	400*	NA	NR	ug/L	LAB	1972. Pawlaczyk-Szpilowa, M., M. Moskal, and J. Weretelnik. Przydatnosc Testow Biologicznych D Okreslenia Toksycznosci Niektorych Zwiazkow Chemicznych W Wodach (The Usefulness of Biological Tests for Determining the Toxicity of Some Chemical Compounds in Water. Acta Hydrobiol.14(2): 115-127.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR	Not Reported	T	100*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Abraham, J.V., R.D. Butler, and D.C. Sigee. Quantified Elemental Changes in Aspidisca cicada and Vorticella convallaria After Exposure to Aluminium, Copper, and Zinc. Protoplasma198(3-4): 143-154.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	0.00001	NR	NR	M	LAB	1959. Wang, H.. Analyses of a Toxic Factor, Lethal to Paramecium Present in Non-Glass-Distilled Water. Proc. Soc. Exp. Biol. Med.101: 682-685.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	34	L	0.9	ug	LAB	2009. Nogueira, P.F.M., M.G.G. Melao, A.T. Lombardi, and M.M. Nogueira. Natural DOM Affects Copper Speciation and Bioavailability to Bacteria and Ciliate. Arch. Environ. Contam. Toxicol.57(2): 274-281.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	54	L	0.2	ug	LAB	2009. Nogueira, P.F.M., M.G.G. Melao, A.T. Lombardi, and M.M. Nogueira. Natural DOM Affects Copper Speciation and Bioavailability to Bacteria and Ciliate. Arch. Environ. Contam. Toxicol.57(2): 274-281.
Nitric acid, Copper(2+) salt	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	0.00002	NR	NR	M	LAB	1959. Wang, H.. Analyses of a Toxic Factor, Lethal to Paramecium Present in Non-Glass-Distilled Water. Proc. Soc. Exp. Biol. Med.101: 682-685.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	0.00002	NR	NR	M	LAB	1959. Wang, H.. Analyses of a Toxic Factor, Lethal to Paramecium Present in Non-Glass-Distilled Water. Proc. Soc. Exp. Biol. Med.101: 682-685.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	2000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	1000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	500*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	300*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	NR	Mortality	NR-LETH	Not Reported	T	900	NA	NR	ug/L	LAB	1981. Pande, A.S., R. Sarkar, and K.P. Krishnamoorthi. Toxicity of Copper Sulphate to the Alga, Spirulina platensis, & the Ciliate Tetrahymena pyriformis. Indian J. Exp. Biol.19(5): 500-502.
Sulfuric acid copper(2+) salt (1:1)	Ciliate	Invertebrates	NR	Mortality	NR-LETH	Not Reported	T	700	NA	NR	ug/L	LAB	1981. Pande, A.S., R. Sarkar, and K.P. Krishnamoorthi. Toxicity of Copper Sulphate to the Alga, Spirulina platensis, & the Ciliate Tetrahymena pyriformis. Indian J. Exp. Biol.19(5): 500-502.
Copper chloride (CuCl2)	Ciliate	Invertebrates	Fresh	Mortality	NR-ZERO	Not Reported	T	54	L	0.2	ug	LAB	2009. Nogueira, P.F.M., M.G.G. Melao, A.T. Lombardi, and M.M. Nogueira. Natural DOM Affects Copper Speciation and Bioavailability to Bacteria and Ciliate. Arch. Environ. Contam. Toxicol.57(2): 274-281.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	10130	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	12520	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	1410	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	1770	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	21100	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	4430	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	5390	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	7610	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	7730	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	9520	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Schlenk, D., and C.T. Moore. Effect of pH and Time on the Acute Toxicity of Copper Sulfate to the Ciliate Protozoan Tetrahymena thermophila. Bull. Environ. Contam. Toxicol.53(6): 800-804.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	uM	LAB	2003. Fuma, S., N. Ishii, H. Takeda, K. Miyamoto, K. Yanagisawa, Y. Ichimasa, M. Saito, Z. Kawabata, and G.G. Polikarpov. Ecological Effects of Various Toxic Agents on the Aquatic Microcosm in Comparison with Acute Ionizing Radiation. J. Environ. Radioact.67(1): 1-14.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3300	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Sulfuric acid copper(2+) salt (1:1)	Ciliate Protozoan	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	900	NA	NR	ug/L	LAB	1990. Doucet, C.M., and E.J. Maly. Effect of Copper on the Interaction Between the Predator Didinium nasutum and Its Prey Paramecium caudatum. Can. J. Fish. Aquat. Sci.47(6): 1122-1127.
Copper chloride (CuCl2)	Ciliated Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3.51	NA	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Sulfuric acid copper(2+) salt (1:1)	Ciliated Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	37	NR	NR	ug/L	LAB	1998. Twagilimana, L., J. Bohatier, CA Groliere, F. Bonnemoy, and D. Sargos. A New Low-Cost Microbiotest with the Protozoan Spirostomum teres: Culture Conditions and Assessment of Sensitivity of the Ciliate to 14 Pure Chemicals. Ecotoxicol. Environ. Saf.41(3): 231-244.
Copper	Clam	Molluscs	NR	Mortality	LC5	Not Reported	T	25	NA	NR	ug/L	LAB	1983. Kulkarni, K.M.. Accumulation of Copper, Zinc and Cadmium in the Clam Puphia textile. Environ. Ecol.1(3): 197-199.
Sulfuric acid copper(2+) salt (1:1)	Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	19.2	NR	NR	ug/L	FIELDA	1988. Farris, J.L., J.H. Van Hassel, S.E. Belanger, D.S. Cherry, and J.,Jr. Cairns. Application of Cellulolytic Activity of Asiatic Clams (Corbicula sp.) to In-Stream Monitoring of Power Plant Effluents. Environ. Toxicol. Chem.7: 701-713.
Sulfuric acid copper(2+) salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	2570	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Sulfuric acid copper(2+) salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	1450	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Sulfuric acid copper(2+) salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	1150	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Sulfuric acid copper(2+) salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	910	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Copper	Clam	Molluscs	NR	Mortality	LC95	Not Reported	T	1280	NA	NR	ug/L	LAB	1983. Kulkarni, K.M.. Accumulation of Copper, Zinc and Cadmium in the Clam Puphia textile. Environ. Ecol.1(3): 197-199.
Copper chloride	Columbia-River Spire Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.
Copper chloride	Columbia-River Spire Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.
Sulfuric acid copper(2+) salt (1:1)	Common Rangia Or Clam	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	780	NA	NR	ug/L	LAB	1973. Olson, K.R., and R.C. Harrel. Effect of Salinity on Acute Toxicity of Mercury, Copper, and Chromium for Rangia cuneata (Pelecypoda, Mactridae). Contrib. Mar. Sci17: 9-13.
Sulfuric acid copper(2+) salt (1:1)	Common Rangia Or Clam	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	250	NA	NR	ug/L	LAB	1973. Olson, K.R., and R.C. Harrel. Effect of Salinity on Acute Toxicity of Mercury, Copper, and Chromium for Rangia cuneata (Pelecypoda, Mactridae). Contrib. Mar. Sci17: 9-13.
Sulfuric acid copper(2+) salt (1:1)	Common Rangia Or Clam	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	210	NA	NR	ug/L	LAB	1973. Olson, K.R., and R.C. Harrel. Effect of Salinity on Acute Toxicity of Mercury, Copper, and Chromium for Rangia cuneata (Pelecypoda, Mactridae). Contrib. Mar. Sci17: 9-13.
Nitric acid, Copper salt	Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1440	NR	NR	ug/L	LAB	2009. Di Marzio, W.D., D. Castaldo, C. Pantani, A. Di Cioccio, T. Di Lorenzo, M.E. Saenz, and D.M.P. Galassi. Relative Sensitivity of Hyporheic Copepods to Chemicals. Bull. Environ. Contam. Toxicol.82(4): 488-491.
Sulfuric acid copper(2+) salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	75		NC	ug/L	LAB	2004. Wong, C.K., and A.P. Pak. Acute and Subchronic Toxicity of the Heavy Metals Copper, Chromium, Nickel, and Zinc, Individually and in Mixture, to the Freshwater Copepod Mesocyclops pehpeiensis. Bull. Environ. Contam. Toxicol.73(1): 190-196.
Sulfuric acid copper(2+) salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	T	0.000024	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Sulfuric acid copper(2+) salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	0.00005	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Sulfuric acid copper(2+) salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.000001	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Copper chloride (CuCl2)	Copepod Subclass	Crustaceans	Fresh	Growth	NR		T	0.66	NA	NR	umol/L	LAB	1984. Borgmann, U., and K.M. Ralph. Copper Complexation and Toxicity to Freshwater Zooplankton. Arch. Environ. Contam. Toxicol.13(4): 403-409.
Copper chloride (CuCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Copper chloride (CuCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	32	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Copper chloride (CuCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	56	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	320	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Copper chloride (CuCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Copper chloride (CuCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28000	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Copper chloride (CuCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Copper chloride (CuCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Sulfuric acid copper(2+) salt (1:1)	Crab	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	2004. Medesani, D.A., L.S.L. Greco, and E.M. Rodriguez. Interference of Cadmium and Copper with the Endocrine Control of Ovarian Growth, in the Estuarine Crab Chasmagnathus granulata. Aquat. Toxicol.69(2): 165-174.
Sulfuric acid copper(2+) salt (1:1)	Crab	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	2004. Medesani, D.A., L.S.L. Greco, and E.M. Rodriguez. Interference of Cadmium and Copper with the Endocrine Control of Ovarian Growth, in the Estuarine Crab Chasmagnathus granulata. Aquat. Toxicol.69(2): 165-174.
Sulfuric acid copper(2+) salt (1:1)	Crab	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	2004. Medesani, D.A., L.S.L. Greco, and E.M. Rodriguez. Interference of Cadmium and Copper with the Endocrine Control of Ovarian Growth, in the Estuarine Crab Chasmagnathus granulata. Aquat. Toxicol.69(2): 165-174.
Sulfuric acid copper(2+) salt (1:1)	Crab	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	2004. Medesani, D.A., L.S.L. Greco, and E.M. Rodriguez. Interference of Cadmium and Copper with the Endocrine Control of Ovarian Growth, in the Estuarine Crab Chasmagnathus granulata. Aquat. Toxicol.69(2): 165-174.
Sulfuric acid copper(2+) salt (1:1)	Crab	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	25000	NR	NR	ug/L	LAB	1999. Reddy, P.S.. Modulations in Antioxidant Enzymes in the Hepatopancreas and Gill of the Fresh Water Crab Oziotelphusa senex senex During Exposure to Cadmium and Copper. Fresenius Environ. Bull.8(7-8): 445-452.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Growth	NR	Whole Organism	T	NR	NA	NR	ug/L	LAB	1967. Hubschman, J.H.. Effects of Copper on Crayfish Orconectes rusticus (Girard): I. Acute Toxicity. Crustaceana (Leiden)12(Pt.1): 33-42.
Copper	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	2370	NR	NR	ug/L	LAB	1994. Dobbs, M.G., J.L. Farris, R.J. Reash, D.S. Cherry, and J.,Jr. Cairns. Evaluation of the Resident-Species Procedure for Developing Site-Specific Water Quality Criteria for Copper in Blaine Creek, Kentucky. Environ. Toxicol. Chem.13(6): 963-971.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3480	NA	NR	ug/L	LAB	1995. Taylor, R.M., G.D. Watson, and M.A. Alikhan. Comparative Sub-lethal and Lethal Acute Toxicity of Copper to the Freshwater Crayfish, Cambarus robustus (Cambaridae, Decapoda, Crustacea) from an Acidic Metal-Contaminated Lake and a Circumneutral Uncontaminated Stream. Water Res.29(2): 401-408.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1995. Taylor, R.M., G.D. Watson, and M.A. Alikhan. Comparative Sub-lethal and Lethal Acute Toxicity of Copper to the Freshwater Crayfish, Cambarus robustus (Cambaridae, Decapoda, Crustacea) from an Acidic Metal-Contaminated Lake and a Circumneutral Uncontaminated Stream. Water Res.29(2): 401-408.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1490	NA	NR	ug/L	LAB	1995. Taylor, R.M., G.D. Watson, and M.A. Alikhan. Comparative Sub-lethal and Lethal Acute Toxicity of Copper to the Freshwater Crayfish, Cambarus robustus (Cambaridae, Decapoda, Crustacea) from an Acidic Metal-Contaminated Lake and a Circumneutral Uncontaminated Stream. Water Res.29(2): 401-408.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1020	NA	NR	ug/L	LAB	1995. Taylor, R.M., G.D. Watson, and M.A. Alikhan. Comparative Sub-lethal and Lethal Acute Toxicity of Copper to the Freshwater Crayfish, Cambarus robustus (Cambaridae, Decapoda, Crustacea) from an Acidic Metal-Contaminated Lake and a Circumneutral Uncontaminated Stream. Water Res.29(2): 401-408.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	970	NA	NR	ug/L	LAB	1995. Taylor, R.M., G.D. Watson, and M.A. Alikhan. Comparative Sub-lethal and Lethal Acute Toxicity of Copper to the Freshwater Crayfish, Cambarus robustus (Cambaridae, Decapoda, Crustacea) from an Acidic Metal-Contaminated Lake and a Circumneutral Uncontaminated Stream. Water Res.29(2): 401-408.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	830	NA	NR	ug/L	LAB	1995. Taylor, R.M., G.D. Watson, and M.A. Alikhan. Comparative Sub-lethal and Lethal Acute Toxicity of Copper to the Freshwater Crayfish, Cambarus robustus (Cambaridae, Decapoda, Crustacea) from an Acidic Metal-Contaminated Lake and a Circumneutral Uncontaminated Stream. Water Res.29(2): 401-408.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20000		NC	ug/L	LAB	2006. Khan, M.A.Q., S.A. Ahmed, B. Catalin, A. Khodadoust, O. Ajayi, and M. Vaughn. Effect of Temperature on Heavy Metal Toxicity to Juvenile Crayfish, Orconectes immunis (Hagen). Environ. Toxicol.21(5): 513-520.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3000	NR	NR	ug/L	LAB	1967. Hubschman, J.H.. Effects of Copper on Crayfish Orconectes rusticus (Girard): I. Acute Toxicity. Crustaceana (Leiden)12(Pt.1): 33-42.
Copper chloride (CuCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	120	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	60	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austropotamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Copper chloride (CuCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	120	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austropotamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Copper chloride (CuCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	200	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austropotamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Copper chloride (CuCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	600	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austropotamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Copper chloride (CuCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	600	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austropotamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Guner, U.. Freshwater Crayfish Astacus leptodactylus (Eschscholtz, 1823) Accumulates and Depurates Copper. Environ. Monit. Assess.133(1-3): 365-369.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Hubschman, J.H.. Effects of Copper on Crayfish Orconectes rusticus (Girard): I. Acute Toxicity. Crustaceana (Leiden)12(Pt.1): 33-42.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1967. Hubschman, J.H.. Effects of Copper on Crayfish Orconectes rusticus (Girard): I. Acute Toxicity. Crustaceana (Leiden)12(Pt.1): 33-42.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NA	NR	ug/L	LAB	1988. Bills, T.D., and L.L. Marking. Control of Nuisance Populations of Crayfish with Traps and Toxicants. Prog. Fish-Cult.50: 103-106.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1967. Hubschman, J.H.. Effects of Copper on Crayfish Orconectes rusticus (Girard): I. Acute Toxicity. Crustaceana (Leiden)12(Pt.1): 33-42.
Sulfuric acid copper(2+) salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1980. Evans, M.L.. Copper Accumulation in the Crayfish (Orconectes rusticus). Bull. Environ. Contam. Toxicol.24(6): 916-920.
Sulfuric acid copper(2+) salt (1:1)	Cumberland Moccasinshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	37	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Cumberland Moccasinshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Cumberland Moccasinshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	41	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Cumberland Moccasinshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	46	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Cumberland Moccasinshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	69	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Cumberland Moccasinshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	81	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Cumberland Moccasinshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	16	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1856	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2486	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3468	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5745	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1519	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2131	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2741	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4767	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1333	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1593	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2212	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4123	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	252	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1236	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1555	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1586	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3279	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2005. Das, B.K., and N. Das. Impacts of Quicklime (CaO) on the Toxicity of Copper (CuSO4, 5H2O) to Fish and Fish Food Organisms. Chemosphere61(2): 186-191.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	230*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	250*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid copper(2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	400*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Copper	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	10200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Copper	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	4600	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid copper(2+) salt (1:1)	Dragonfly	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	0.045	NR	NR	mM	LAB	2009. Tollett, V.D., E.L. Benvenutti, L.A. Deer, and T.M. Rice. Differential Toxicity to Cd, Pb, and Cu in Dragonfly Larvae (Insecta: Odonata). Arch. Environ. Contam. Toxicol.56(1): 77-84.
Sulfuric acid copper(2+) salt (1:1)	Dragonfly	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	2.36	NR	NR	mM	LAB	2009. Tollett, V.D., E.L. Benvenutti, L.A. Deer, and T.M. Rice. Differential Toxicity to Cd, Pb, and Cu in Dragonfly Larvae (Insecta: Odonata). Arch. Environ. Contam. Toxicol.56(1): 77-84.
Sulfuric acid copper(2+) salt (1:1)	Dragonfly	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	1.18	NR	NR	mM	LAB	2009. Tollett, V.D., E.L. Benvenutti, L.A. Deer, and T.M. Rice. Differential Toxicity to Cd, Pb, and Cu in Dragonfly Larvae (Insecta: Odonata). Arch. Environ. Contam. Toxicol.56(1): 77-84.
Copper chloride (CuCl2)	Dwarf Pond Snail	Molluscs	NR	Reproduction	NR	Not Reported	T	400*	NA	NR	ug/L	NR	1988. Rondelaud, D.. Effects of a Sublethal Dose of a Molluscicide (CuCl2) on the Reproductive Activity and the Movements of the Snail Host, Lymnaea truncatula Muller (Les Effets d'une Concentration Subletale de Molluscicide (CuCl2) sur l'Ac. Ann. Rech. Vet.19(4): 273-278.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Dwarf Wedge Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	86	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Sulfuric acid copper(2+) salt (1:1)	Dwarf Wedge Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	86	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Copper	Earthworm	Worms	NR	Mortality	LC50	Not Reported	T	63400000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Copper chloride (CuCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	430	NR	NR	ug/L	LAB	1996. Willuhn, J., A. Otto, H. Koewius, and F. Wunderlich. Subtoxic Cadmium-Concentrations Reduce Copper-Toxicity in the Earthworm Enchytraeus buchholzi. Chemosphere32(11): 2205-2210.
Copper chloride (CuCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	390	NR	NR	ug/L	LAB	1996. Willuhn, J., A. Otto, H. Koewius, and F. Wunderlich. Subtoxic Cadmium-Concentrations Reduce Copper-Toxicity in the Earthworm Enchytraeus buchholzi. Chemosphere32(11): 2205-2210.
Copper	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	71600000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Copper	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	72300000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Copper	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	74800000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Copper	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	34900000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Copper	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	69600000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Copper	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	85300000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Copper	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	60800000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Copper	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	65700000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Copper chloride (CuCl2)	Earthworm	Worms	Fresh	Mortality	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1996. Willuhn, J., A. Otto, H. Koewius, and F. Wunderlich. Subtoxic Cadmium-Concentrations Reduce Copper-Toxicity in the Earthworm Enchytraeus buchholzi. Chemosphere32(11): 2205-2210.
Copper	Ellipse	Molluscs	Fresh	Mortality	EC50	Not Reported	T	18	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Ellipse	Molluscs	Fresh	Mortality	EC50	Not Reported	T	10	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Ellipse	Molluscs	Fresh	Mortality	EC50	Not Reported	T	9	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Sulfuric acid copper(2+) salt (1:1)	Ellipse	Molluscs	Fresh	Mortality	EC50	Not Reported	T	18	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Ellipse	Molluscs	Fresh	Mortality	EC50	Not Reported	T	10	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Ellipse	Molluscs	Fresh	Mortality	EC50	Not Reported	T	8.6	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	137000	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	123000	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	98400	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	106100	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	270200	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	242800	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	240800	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	207600	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	192200	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	173500	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	153900	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Copper	European Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	148400	NR	NR	ug/L	LAB	1999. Burba, A.. The Effect of Copper on Behavioural Reactions of Noble Crayfish Astacus astacus L.. Acta Zool. Litu.9(2): 30-36.
Sulfuric acid copper(2+) salt (1:1)	European Dagger Nematode	Worms	Fresh	Mortality	LOEL	Not Reported	T	100		NC	ug/L	LAB	1972. Pitcher, R.S., and D.G. McNamara. The Toxicity of Low Concentrations of Silver and Cupric Ions to Three Species of Plant-Parasitic Nematodes. Nematologica18: 385-390.
Copper hydroxide (Cu(OH)2)	European Physa	Molluscs	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1972. Nishiuchi, Y., and K. Yoshida. Toxicities of Pesticides to Some Fresh Water Snails. Bull.Agric.Chem.Insp.Stn.(Tokyo)12: 86-92.
Sulfuric acid copper(2+) salt (1:1)	European Physa	Molluscs	Fresh	Mortality	LC50	Not Reported	T	400*	NA	NR	ug/L	LAB	1972. Nishiuchi, Y., and K. Yoshida. Toxicities of Pesticides to Some Fresh Water Snails. Bull.Agric.Chem.Insp.Stn.(Tokyo)12: 86-92.
Sulfuric acid copper(2+) salt (1:1)	European Physa	Molluscs	Fresh	Mortality	LC50	Not Reported	T	280	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	European Physa	Molluscs	Fresh	Mortality	LC90	Not Reported	T	500	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Copper chloride (CuCl2)	European Physa	Molluscs	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1985. Piccinni, E., O. Coppellotti, L. Giannoni, and O. Ravera. Effects of Cu, Cd, V in Physa acuta (Draparnaud). I: Partial Characterisation of Chelating Compounds. Environ. Technol. Lett.6(11): 505-513.
Sulfuric acid copper(2+) salt (1:1)	European Physa	Molluscs	Fresh	Mortality	NR	Not Reported	T	5000*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.
Sulfuric acid copper(2+) salt (1:1)	European Physa	Molluscs	Fresh	Mortality	NR	Not Reported	T	5000*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.
Sulfuric acid copper(2+) salt (1:1)	European Physa	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5000*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.
Copper chloride (CuCl2)	European Physa	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	1985. Piccinni, E., O. Coppellotti, L. Giannoni, and O. Ravera. Effects of Cu, Cd, V in Physa acuta (Draparnaud). I: Partial Characterisation of Chelating Compounds. Environ. Technol. Lett.6(11): 505-513.
Copper chloride (CuCl2)	Euryhaline Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	99	NR	NR	ug/L	LAB	1998. Hyne, R.V., and D.A. Everett. Application of a Benthic Euryhaline Amphipod, Corophium sp., as a Sediment Toxicity Testing Organism for Both Freshwater and Estuarine Systems. Arch. Environ. Contam. Toxicol.34(1): 26-33.
Copper chloride (CuCl2)	Euryhaline Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	1998. Hyne, R.V., and D.A. Everett. Application of a Benthic Euryhaline Amphipod, Corophium sp., as a Sediment Toxicity Testing Organism for Both Freshwater and Estuarine Systems. Arch. Environ. Contam. Toxicol.34(1): 26-33.
Copper chloride (CuCl2)	Euryhaline Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	86	NR	NR	ug/L	LAB	1998. Hyne, R.V., and D.A. Everett. Application of a Benthic Euryhaline Amphipod, Corophium sp., as a Sediment Toxicity Testing Organism for Both Freshwater and Estuarine Systems. Arch. Environ. Contam. Toxicol.34(1): 26-33.
Copper chloride (CuCl2)	Euryhaline Amphipod	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	320	NR	NR	ug/L	LAB	1998. Hyne, R.V., and D.A. Everett. Application of a Benthic Euryhaline Amphipod, Corophium sp., as a Sediment Toxicity Testing Organism for Both Freshwater and Estuarine Systems. Arch. Environ. Contam. Toxicol.34(1): 26-33.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper oxide (CuO)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC20	Not Reported	T	1320	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Copper oxide (CuO)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC20	Not Reported	T	49700	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC20	Not Reported	T	30	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Copper oxide (CuO)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1700	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Copper oxide (CuO)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	75600	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.8	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	440	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	520	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	530	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	77	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Acute Toxicity Tests with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca): Influence of Selected Environmental Conditions. Chemosphere27(11): 2213-2224.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Centeno, M.D.F., L. Brendonck, and G. Persoone. Influence of Production, Processing, and Storage Conditions of Resting Eggs of Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca) on the Sensitivity of Larvae to Selected Reference Toxicants. Bull. Environ. Contam. Toxicol.51(6): 927-934.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	80	NA	NR	ug/L	LAB	1994. Crisinel, A., L. Delaunay, D. Rossel, J. Tarradellas, H. Meyer, H. Saiah, P. Vogel, C. Delisle, and C. Blaise. Cyst-Based Ecotoxicological Tests Using Anostracans: Comparison of Two Species of Streptocephalus. Environ. Toxicol. Water Qual.9(4): 317-326.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	40	NA	NR	ug/L	LAB	1994. Crisinel, A., L. Delaunay, D. Rossel, J. Tarradellas, H. Meyer, H. Saiah, P. Vogel, C. Delisle, and C. Blaise. Cyst-Based Ecotoxicological Tests Using Anostracans: Comparison of Two Species of Streptocephalus. Environ. Toxicol. Water Qual.9(4): 317-326.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1995. Centeno, M.D.F., G. Persoone, and M.P. Goyvaerts. Cyst-Based Toxicity Tests. IX. The Potential of Thamnocephalus platyurus as Test Species in Comparison with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca). Environ. Toxicol. Water Qual.10(4): 275-282.
Copper oxide (CuO)	Fairy Shrimp	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	20000	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Copper oxide (CuO)	Fairy Shrimp	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Sulfuric acid copper(2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Sulfuric acid copper(2+) salt (1:1)	Flathead Mayfly	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Hatakeyama, S.. Effect of Copper and Zinc on the Growth and Emergence of Epeorus latifolium (Ephemeroptera) in an Indoor Model Stream. Hydrobiologia174(1): 17-27.
Sulfuric acid copper(2+) salt (1:1)	Flathead Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Hatakeyama, S.. Effect of Copper and Zinc on the Growth and Emergence of Epeorus latifolium (Ephemeroptera) in an Indoor Model Stream. Hydrobiologia174(1): 17-27.
Sulfuric acid copper(2+) salt (1:1)	Flatly Coiled Gyraulus	Molluscs	Fresh	Mortality	LC50	Not Reported	T	425	NA	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Sulfuric acid copper(2+) salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	310	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid copper(2+) salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	310	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid copper(2+) salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid copper(2+) salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	260	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid copper(2+) salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid copper(2+) salt (1:1)	Fluke Class	Worms	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	FIELDA	1975. Shukla, S.S., and R.M. Roy. Studies on the Comparative Molluscicide Effects of N-Tritylmorpholine and Copper Sulphate on the Common Aquatic Snails in Andhra Pradesh (India). Trop. Anim. Health Prod.7(1): 45-50.
Copper	Fluke Class	Worms	NR	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1987. Zhokhov, A.E.. Effect of the Pollution of Water-Bodies on Life Cycles in Trematodes. C. A. Sel. -Environ. Pollut.17: 1 p..
Copper	Fragile Papershell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Copper	Fragile Papershell	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Copper chloride (CuCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	5241.8		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Copper chloride (CuCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	1848		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Copper chloride (CuCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	1156.4		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Copper chloride (CuCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	504.8		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Copper chloride (CuCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8155.4		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Copper chloride (CuCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4028.5		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Copper chloride (CuCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2874.7		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Copper chloride (CuCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1365.2		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Field Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	271010	NR	NR	ug/L	LAB	2007. Senthilkumar, P., K. Samyappan, S. Jayakumar, and M. Deecaraman. Effect of Heavy Metal Copper on the Nutritive Value in a Freshwater Field Crab, Spiralothelphusa hydrodroma. Res. J. Agric. Biol. Sci.3(6): 775-781.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Field Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	271010	NR	NR	ug/L	LAB	2007. Senthilkumar, P., K. Samyappan, S. Jayakumar, and M. Deecaraman. Impact of Heavy Metal Copper on the Neurosecretory Cells in a Freshwater Field Crab, Spiralothelphusa hydrodroma. Res. J. Agric. Biol. Sci.3(6): 584-589.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Field Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	265460	NR	NR	ug/L	LAB	2007. Senthilkumar, P., K. Samyappan, S. Jayakumar, and M. Deecaraman. Effect of Heavy Metal Copper on the Nutritive Value in a Freshwater Field Crab, Spiralothelphusa hydrodroma. Res. J. Agric. Biol. Sci.3(6): 775-781.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Field Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	265460	NR	NR	ug/L	LAB	2007. Senthilkumar, P., K. Samyappan, S. Jayakumar, and M. Deecaraman. Impact of Heavy Metal Copper on the Neurosecretory Cells in a Freshwater Field Crab, Spiralothelphusa hydrodroma. Res. J. Agric. Biol. Sci.3(6): 584-589.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Field Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	257030	NR	NR	ug/L	LAB	2007. Senthilkumar, P., K. Samyappan, S. Jayakumar, and M. Deecaraman. Effect of Heavy Metal Copper on the Nutritive Value in a Freshwater Field Crab, Spiralothelphusa hydrodroma. Res. J. Agric. Biol. Sci.3(6): 775-781.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Field Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	257030	NR	NR	ug/L	LAB	2007. Senthilkumar, P., K. Samyappan, S. Jayakumar, and M. Deecaraman. Impact of Heavy Metal Copper on the Neurosecretory Cells in a Freshwater Field Crab, Spiralothelphusa hydrodroma. Res. J. Agric. Biol. Sci.3(6): 584-589.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Field Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	254680	NR	NR	ug/L	LAB	2007. Senthilkumar, P., K. Samyappan, S. Jayakumar, and M. Deecaraman. Effect of Heavy Metal Copper on the Nutritive Value in a Freshwater Field Crab, Spiralothelphusa hydrodroma. Res. J. Agric. Biol. Sci.3(6): 775-781.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Field Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	254680	NR	NR	ug/L	LAB	2007. Senthilkumar, P., K. Samyappan, S. Jayakumar, and M. Deecaraman. Impact of Heavy Metal Copper on the Neurosecretory Cells in a Freshwater Field Crab, Spiralothelphusa hydrodroma. Res. J. Agric. Biol. Sci.3(6): 584-589.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Freshwater Planarian	Worms	Fresh	Mortality	LC50	Not Reported	T	3.85E-05		NC	M	LAB	2001. Guecheva, T., J.A.P. Henriques, and B. Erdtmann. Genotoxic Effects of Copper Sulphate in Freshwater Planarian In Vivo, Studied with the Single-Cell Gel Test (Comet Assay). Mutat. Res.497(1-2): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Planarian	Worms	Fresh	Mortality	LC50	Not Reported	T	0.000015		NC	M	LAB	2001. Guecheva, T., J.A.P. Henriques, and B. Erdtmann. Genotoxic Effects of Copper Sulphate in Freshwater Planarian In Vivo, Studied with the Single-Cell Gel Test (Comet Assay). Mutat. Res.497(1-2): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1634	NR	NR	ug/L	LAB	2006. Lodhi, H.S., M.A. Khan, R.S. Verma, and U.D. Sharma. Acute Toxicity of Copper Sulphate to Fresh Water Prawns. J. Environ. Biol.27(3): 585-588.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	988	NR	NR	ug/L	LAB	2006. Lodhi, H.S., M.A. Khan, R.S. Verma, and U.D. Sharma. Acute Toxicity of Copper Sulphate to Fresh Water Prawns. J. Environ. Biol.27(3): 585-588.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	532	NR	NR	ug/L	LAB	2006. Lodhi, H.S., M.A. Khan, R.S. Verma, and U.D. Sharma. Acute Toxicity of Copper Sulphate to Fresh Water Prawns. J. Environ. Biol.27(3): 585-588.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	418	NR	NR	ug/L	LAB	2006. Lodhi, H.S., M.A. Khan, R.S. Verma, and U.D. Sharma. Acute Toxicity of Copper Sulphate to Fresh Water Prawns. J. Environ. Biol.27(3): 585-588.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Prawns	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	72*	NA	NR	ug/L	LAB	1979. Ghate, H.V., and L. Mulherkar. Histological Changes in the Gills of Two Freshwater Prawn Species Exposed to Copper Sulphate. Indian J. Exp. Biol.17(8): 838-840.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26.7	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32.6	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2800	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	Freshwater Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	5200	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	Fresh-Water Sponge	Invertebrates	Fresh	Growth	NR		T	'1E-7	NA	NR	M	LAB	1988. Francis, J.C., and F.W. Harrison. Copper and Zinc Toxicity in Ephydatia fluviatilis (Porifera: Spongillidae). Trans. Am. Microsc. Soc.107(1): 67-78.
Copper	Gastropod	Molluscs	Fresh	Mortality	LC50	Not Reported	D	109	NR	NR	ug/L	LAB	1994. Dobbs, M.G., J.L. Farris, R.J. Reash, D.S. Cherry, and J.,Jr. Cairns. Evaluation of the Resident-Species Procedure for Developing Site-Specific Water Quality Criteria for Copper in Blaine Creek, Kentucky. Environ. Toxicol. Chem.13(6): 963-971.
Sulfuric acid copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	LC50	Not Reported	T	440	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Sulfuric acid copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	LC50	Not Reported	T	470	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Sulfuric acid copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	LC50	Not Reported	T	280	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Sulfuric acid copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	LC50	Not Reported	T	47	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Sulfuric acid copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	LC50	Not Reported	T	125	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Sulfuric acid copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	LC50	Not Reported	T	35	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Sulfuric acid copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	LC50	Not Reported	T	35	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Sulfuric acid copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	LC50	Not Reported	T	83	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Sulfuric acid copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	LETC	Not Reported	T	7.27	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Carbonic acid, Copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	NR	Not Reported	T	24000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Carbonic acid, Copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Carbonic acid, Copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Carbonic acid, Copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Carbonic acid, Copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Carbonic acid, Copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Carbonic acid, Copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Carbonic acid, Copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Carbonic acid, Copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Copper oxide (CuO)	Gastropod Order	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Carbonic acid, Copper(2+) salt (1:1)	Gastropod Order	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	10000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Copper oxide (CuO)	Gastropod Order	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	10000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Copper oxide (CuO)	Gastropod Order	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	50000	NR	NR	ug/L	LAB	1964. Howard, T.E., H.N. Halvorson, and C.C. Walden. Toxicity of Copper Compounds to the Snail Vector Hosts of the Agent of Schistosoma Dermatitis, in Waters of Differing Hardness. Am. J. Hyg.80: 33-44.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Growth	MATC	Not Reported	T	45	NR	NR	ug/L	LAB	2005. Li, N., Y.L. Zhao, and J. Yang. Accumulation, Distribution, and Toxicology of Copper Sulfate in Juvenile Giant Freshwater Prawns, Macrobrachium rosenbergii. Bull. Environ. Contam. Toxicol.75(3): 497-504.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Growth	MATC	Not Reported	T	45	NR	NR	ug/L	LAB	2005. Li, N., Y.L. Zhao, and J. Yang. Accumulation, Distribution, and Toxicology of Copper Sulfate in Juvenile Giant Freshwater Prawns, Macrobrachium rosenbergii. Bull. Environ. Contam. Toxicol.75(3): 497-504.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Growth	NOEL	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Li, N., Y. Zhao, and J. Yang. Effects of Water-Borne Copper on Digestive and Metabolic Enzymes of the Giant Freshwater Prawn Macrobrachium rosenbergii. Arch. Environ. Contam. Toxicol.55(1): 86-93.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	390	NA	NR	ug/L	LAB	1990. Liao, I.C., and J.J. Guo. Studies on the Tolerance of Postlarvae of Penaeus monodon, P. japonicus, P. semisulcatus, P. penicillatus, Metapenaeus ensis and Macrobrachium rosenbergii to Copper Sulfate, Potassium Permanganate and Malachite Green. COA (Counc. Agric.) Fish. Ser.24: 90-94.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	525	NR	NR	ug/L	LAB	2005. Li, N., Y.L. Zhao, and J. Yang. Accumulation, Distribution, and Toxicology of Copper Sulfate in Juvenile Giant Freshwater Prawns, Macrobrachium rosenbergii. Bull. Environ. Contam. Toxicol.75(3): 497-504.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1040	NA	NR	ug/L	LAB	1992. Natarajan, E., R.S. Biradar, and J.P. George. Acute Toxicity of Pesticides to Giant Freshwater Prawn Macrobrachium rosenbergii (De Man). J. Aquacult. Trop.7(2): 183-187.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1220	NA	NR	ug/L	LAB	1992. Natarajan, E., R.S. Biradar, and J.P. George. Acute Toxicity of Pesticides to Giant Freshwater Prawn Macrobrachium rosenbergii (De Man). J. Aquacult. Trop.7(2): 183-187.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	453	NR	NR	ug/L	LAB	2005. Li, N., Y.L. Zhao, and J. Yang. Accumulation, Distribution, and Toxicology of Copper Sulfate in Juvenile Giant Freshwater Prawns, Macrobrachium rosenbergii. Bull. Environ. Contam. Toxicol.75(3): 497-504.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35	NA	NR	ug/L	LAB	1992. Natarajan, E., R.S. Biradar, and J.P. George. Acute Toxicity of Pesticides to Giant Freshwater Prawn Macrobrachium rosenbergii (De Man). J. Aquacult. Trop.7(2): 183-187.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35	NA	NR	ug/L	LAB	1992. Natarajan, E., R.S. Biradar, and J.P. George. Acute Toxicity of Pesticides to Giant Freshwater Prawn Macrobrachium rosenbergii (De Man). J. Aquacult. Trop.7(2): 183-187.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	180	NR	NR	ug/L	NR	2004. Osunde, I.M., S. Coyle, and J. Tidwell. Toxicity of Copper to Juvenile Freshwater Prawns, Macrobrachium rosenbergii. J. Appl. Aquacult.14(3-4): 71-79.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	454	NR	NR	ug/L	LAB	2005. Li, N., Y.L. Zhao, and J. Yang. Accumulation, Distribution, and Toxicology of Copper Sulfate in Juvenile Giant Freshwater Prawns, Macrobrachium rosenbergii. Bull. Environ. Contam. Toxicol.75(3): 497-504.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	452	NR	NR	ug/L	LAB	2005. Li, N., Y.L. Zhao, and J. Yang. Accumulation, Distribution, and Toxicology of Copper Sulfate in Juvenile Giant Freshwater Prawns, Macrobrachium rosenbergii. Bull. Environ. Contam. Toxicol.75(3): 497-504.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12	NA	NR	ug/L	LAB	1992. Natarajan, E., R.S. Biradar, and J.P. George. Acute Toxicity of Pesticides to Giant Freshwater Prawn Macrobrachium rosenbergii (De Man). J. Aquacult. Trop.7(2): 183-187.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9	NA	NR	ug/L	LAB	1992. Natarajan, E., R.S. Biradar, and J.P. George. Acute Toxicity of Pesticides to Giant Freshwater Prawn Macrobrachium rosenbergii (De Man). J. Aquacult. Trop.7(2): 183-187.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	200	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	200	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	240	NR	NR	ug/L	NR	2004. Osunde, I.M., S. Coyle, and J. Tidwell. Toxicity of Copper to Juvenile Freshwater Prawns, Macrobrachium rosenbergii. J. Appl. Aquacult.14(3-4): 71-79.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	NR	2004. Osunde, I.M., S. Coyle, and J. Tidwell. Toxicity of Copper to Juvenile Freshwater Prawns, Macrobrachium rosenbergii. J. Appl. Aquacult.14(3-4): 71-79.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	200	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	160	NR	NR	ug/L	NR	2004. Osunde, I.M., S. Coyle, and J. Tidwell. Toxicity of Copper to Juvenile Freshwater Prawns, Macrobrachium rosenbergii. J. Appl. Aquacult.14(3-4): 71-79.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	810	NA	NR	ug/L	LAB	1990. Liao, I.C., and J.J. Guo. Studies on the Tolerance of Postlarvae of Penaeus monodon, P. japonicus, P. semisulcatus, P. penicillatus, Metapenaeus ensis and Macrobrachium rosenbergii to Copper Sulfate, Potassium Permanganate and Malachite Green. COA (Counc. Agric.) Fish. Ser.24: 90-94.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	400	NR	NR	ug/L	NR	2004. Osunde, I.M., S. Coyle, and J. Tidwell. Toxicity of Copper to Juvenile Freshwater Prawns, Macrobrachium rosenbergii. J. Appl. Aquacult.14(3-4): 71-79.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	200	NA	NR	ug/L	LAB	1990. Liao, I.C., and J.J. Guo. Studies on the Tolerance of Postlarvae of Penaeus monodon, P. japonicus, P. semisulcatus, P. penicillatus, Metapenaeus ensis and Macrobrachium rosenbergii to Copper Sulfate, Potassium Permanganate and Malachite Green. COA (Counc. Agric.) Fish. Ser.24: 90-94.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	6.52	NR	NR	ug/L	LAB	2006. Reddy, R., B.R. Pillai, and S. Adhikari. Bioaccumulation of Copper in Post-Larvae and Juveniles of Freshwater Prawn Macrobrachium rosenbergii (de Man) Exposed to Sub-Lethal Levels of Copper Sulfate. Aquaculture252(2-4): 356-360.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Cheng, W., and C.H. Wang. The Susceptibility of the Giant Freshwater Prawn Macrobrachium rosenbergii to Lactococcus garvieae and Its Resistance Under Copper Sulfate Stress. Dis. Aquat. Org.47(2): 137-144.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	320	NR	NR	ug/L	LAB	2005. Li, N., Y.L. Zhao, and J. Yang. Accumulation, Distribution, and Toxicology of Copper Sulfate in Juvenile Giant Freshwater Prawns, Macrobrachium rosenbergii. Bull. Environ. Contam. Toxicol.75(3): 497-504.
Sulfuric acid copper(2+) salt (1:1)	Giant River Prawn	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	39	NR	NR	ug/L	LAB	2006. Reddy, R., B.R. Pillai, and S. Adhikari. Bioaccumulation of Copper in Post-Larvae and Juveniles of Freshwater Prawn Macrobrachium rosenbergii (de Man) Exposed to Sub-Lethal Levels of Copper Sulfate. Aquaculture252(2-4): 356-360.
Sulfuric acid copper(2+) salt (1:1)	Great Pond Snail	Molluscs	Fresh	Growth	LOEC	Not Reported	T	25		NC	ug/L	LAB	2000. Girling, A.E., D. Pascoe, C.R. Janssen, A. Peither, A. Wenzel, H. Schafer, B. Neumeier, G.C. Mitchell, E.J. Taylor, S.J.. Development of Methods for Evaluating Toxicity to Freshwater Ecosystems. Ecotoxicol. Environ. Saf.45(2): 148-176.
Sulfuric acid copper(2+) salt (1:1)	Great Pond Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	T	10		NC	ug/L	LAB	2000. Girling, A.E., D. Pascoe, C.R. Janssen, A. Peither, A. Wenzel, H. Schafer, B. Neumeier, G.C. Mitchell, E.J. Taylor, S.J.. Development of Methods for Evaluating Toxicity to Freshwater Ecosystems. Ecotoxicol. Environ. Saf.45(2): 148-176.
Sulfuric acid copper(2+) salt (1:1)	Great Pond Snail	Molluscs	Fresh	Mortality	LC0	Not Reported	T	40		NC	ug/L	LAB	2006. Vyskushenko, A.D.. Effects of Copper Sulfate and Zinc Chloride on Lymnaea stagnalis L.. Hydrobiol. J.42(1): 107-113.
Sulfuric acid copper(2+) salt (1:1)	Great Pond Snail	Molluscs	Fresh	Mortality	LC100	Not Reported	T	4000		NC	ug/L	LAB	2006. Vyskushenko, A.D.. Effects of Copper Sulfate and Zinc Chloride on Lymnaea stagnalis L.. Hydrobiol. J.42(1): 107-113.
Sulfuric acid copper(2+) salt (1:1)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	800		NC	ug/L	LAB	2006. Vyskushenko, A.D.. Effects of Copper Sulfate and Zinc Chloride on Lymnaea stagnalis L.. Hydrobiol. J.42(1): 107-113.
Sulfuric acid copper(2+) salt (1:1)	Great Pond Snail	Molluscs	Fresh	Mortality	LOEC	Not Reported	T	25		NC	ug/L	LAB	2000. Girling, A.E., D. Pascoe, C.R. Janssen, A. Peither, A. Wenzel, H. Schafer, B. Neumeier, G.C. Mitchell, E.J. Taylor, S.J.. Development of Methods for Evaluating Toxicity to Freshwater Ecosystems. Ecotoxicol. Environ. Saf.45(2): 148-176.
Sulfuric acid copper(2+) salt (1:1)	Great Pond Snail	Molluscs	Fresh	Mortality	LOEC	Not Reported	T	25		NC	ug/L	LAB	2000. Girling, A.E., D. Pascoe, C.R. Janssen, A. Peither, A. Wenzel, H. Schafer, B. Neumeier, G.C. Mitchell, E.J. Taylor, S.J.. Development of Methods for Evaluating Toxicity to Freshwater Ecosystems. Ecotoxicol. Environ. Saf.45(2): 148-176.
Sulfuric acid copper(2+) salt (1:1)	Great Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	10		NC	ug/L	LAB	2000. Girling, A.E., D. Pascoe, C.R. Janssen, A. Peither, A. Wenzel, H. Schafer, B. Neumeier, G.C. Mitchell, E.J. Taylor, S.J.. Development of Methods for Evaluating Toxicity to Freshwater Ecosystems. Ecotoxicol. Environ. Saf.45(2): 148-176.
Sulfuric acid copper(2+) salt (1:1)	Great Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	10		NC	ug/L	LAB	2000. Girling, A.E., D. Pascoe, C.R. Janssen, A. Peither, A. Wenzel, H. Schafer, B. Neumeier, G.C. Mitchell, E.J. Taylor, S.J.. Development of Methods for Evaluating Toxicity to Freshwater Ecosystems. Ecotoxicol. Environ. Saf.45(2): 148-176.
Sulfuric acid copper(2+) salt (1:1)	Great Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	2006. Vyskushenko, A.D.. Effects of Copper Sulfate and Zinc Chloride on Lymnaea stagnalis L.. Hydrobiol. J.42(1): 107-113.
Copper chloride (CuCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1971. Kapkov, V.T.. Toxicity of Copper Complexes to Freshwater Mollusks. Army Foreign Sci.and Tech.Center, Charlottesville, VA:5 p.(ENG TRANSL) (1973) (U.S.NTIS, AD-763967) / Vest.Mosk.Univ.Biol.Pochvoved26(2): 34-37.
Sulfuric acid copper(2+) salt (1:1)	Green Floater	Molluscs	Fresh	Mortality	LC50	Not Reported	T	319	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Green Floater	Molluscs	Fresh	Mortality	LC50	Not Reported	T	132.79	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Green Floater	Molluscs	Fresh	Mortality	LC50	Not Reported	T	253.67	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Green Floater	Molluscs	Fresh	Mortality	LC50	Not Reported	T	99.93	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Green Floater	Molluscs	Fresh	Mortality	LC50	Not Reported	T	52.05	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Green Floater	Molluscs	Fresh	Mortality	LC50	Not Reported	T	64.62	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Green Floater	Molluscs	Fresh	Mortality	LC50	Not Reported	T	92.99	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Copper	Green Or Europeon Shore Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	51800		NC	ug/L	LAB	2002. Elumalai, M., C. Antunes, and L. Guilhermino. Effects of Single Metals and Their Mixtures on Selected Enzymes of Carcinus maenas. Water Air Soil Pollut.141(1-4): 273-280.
Copper	Green Or Europeon Shore Crab	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	40000		NC	ug/L	LAB	2002. Elumalai, M., C. Antunes, and L. Guilhermino. Effects of Single Metals and Their Mixtures on Selected Enzymes of Carcinus maenas. Water Air Soil Pollut.141(1-4): 273-280.
Copper	Green Or Europeon Shore Crab	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	30000		NC	ug/L	LAB	2002. Elumalai, M., C. Antunes, and L. Guilhermino. Effects of Single Metals and Their Mixtures on Selected Enzymes of Carcinus maenas. Water Air Soil Pollut.141(1-4): 273-280.
Copper chloride (CuCl2)	Green Or Europeon Shore Crab	Crustaceans	Fresh	Mortality	NR	Not Reported	T	750	NR	NR	ug/L	LAB	1995. Depledge, M.H., A. Aagaard, and P. Gyorkos. Assessment of Trace Metal Toxicity Using Molecular, Physiological and Behavioural Biomarkers. Mar. Pollut. Bull.31(1-3): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	23		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	18		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	13		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	8		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	22		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	56		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	47		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	37		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid copper(2+) salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	31		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Copper chloride	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	190		NC	ug/L	LAB	1982. Bengtsson, B.E., and B. Bergstrom. Toxicity Tests with Nitocra spinipes (Crustacea) and Some Metals Released from a Smelter Industry. In: K.Muller (Ed.), Coastal Research in the Gulf of Bothnia, Chapter 33, Dr.W.Junk Publ., The Hague, Netherlands:439-444 / Chem.Abstr.97: 439-444.
Sulfuric acid copper(2+) salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1983. Rao, S.V.R., and K.J. Nath. Biological Effect of Some Poisons on Canthocamptus (Crustacea spp). Int. J. Environ. Stud.21(3-4): 271-275.
Sulfuric acid copper(2+) salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	100		NC	ug/L	LAB	2008. Lee, K.W., S. Raisuddin, D.S. Hwang, H.G. Park, H.U. Dahms, I.Y. Ahn, and J.S. Lee. Two-Generation Toxicity Study on the Copepod Model Species Tigriopus japonicus. Chemosphere72: 1359-1365.
Sulfuric acid copper(2+) salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	100		NC	ug/L	LAB	2008. Lee, K.W., S. Raisuddin, D.S. Hwang, H.G. Park, H.U. Dahms, I.Y. Ahn, and J.S. Lee. Two-Generation Toxicity Study on the Copepod Model Species Tigriopus japonicus. Chemosphere72: 1359-1365.
Sulfuric acid copper(2+) salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1983. Rao, S.V.R., and K.J. Nath. Biological Effect of Some Poisons on Canthocamptus (Crustacea spp). Int. J. Environ. Stud.21(3-4): 271-275.
Sulfuric acid copper(2+) salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	250	NA	NR	ug/L	LAB	1983. Rao, S.V.R., and K.J. Nath. Biological Effect of Some Poisons on Canthocamptus (Crustacea spp). Int. J. Environ. Stud.21(3-4): 271-275.
Sulfuric acid copper(2+) salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	100		NC	ug/L	LAB	2008. Lee, K.W., S. Raisuddin, D.S. Hwang, H.G. Park, H.U. Dahms, I.Y. Ahn, and J.S. Lee. Two-Generation Toxicity Study on the Copepod Model Species Tigriopus japonicus. Chemosphere72: 1359-1365.
Sulfuric acid copper(2+) salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	100		NC	ug/L	LAB	2008. Lee, K.W., S. Raisuddin, D.S. Hwang, H.G. Park, H.U. Dahms, I.Y. Ahn, and J.S. Lee. Two-Generation Toxicity Study on the Copepod Model Species Tigriopus japonicus. Chemosphere72: 1359-1365.
Copper	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	84		NC	ug/L	LAB	2002. Karntanut, W., and D. Pascoe. The Toxicity of Copper, Cadmium and Zinc to Four Different Hydra (Cnidaria: Hydrozoa). Chemosphere47(10): 1059-1064.
Copper	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	25		NC	ug/L	LAB	2002. Karntanut, W., and D. Pascoe. The Toxicity of Copper, Cadmium and Zinc to Four Different Hydra (Cnidaria: Hydrozoa). Chemosphere47(10): 1059-1064.
Copper	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	42		NC	ug/L	LAB	2002. Karntanut, W., and D. Pascoe. The Toxicity of Copper, Cadmium and Zinc to Four Different Hydra (Cnidaria: Hydrozoa). Chemosphere47(10): 1059-1064.
Copper	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	56		NC	ug/L	LAB	2002. Karntanut, W., and D. Pascoe. The Toxicity of Copper, Cadmium and Zinc to Four Different Hydra (Cnidaria: Hydrozoa). Chemosphere47(10): 1059-1064.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	28		NC	ug/L	LAB	2005. Karntanut, W., and D. Pascoe. Effects of Removing Symbiotic Green Algae on the Response of Hydra viridissima (Pallas 1776) to Metals. Ecotoxicol. Environ. Saf.60(3): 301-305.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	31		NC	ug/L	LAB	2005. Karntanut, W., and D. Pascoe. Effects of Removing Symbiotic Green Algae on the Response of Hydra viridissima (Pallas 1776) to Metals. Ecotoxicol. Environ. Saf.60(3): 301-305.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	8.5	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	410	NA	NR	ug/L	LAB	1998. Beach, M.J., and D. Pascoe. The Role of Hydra vulgaris (Pallas) in Assessing the Toxicity of Freshwater Pollutants. Water Res.32(1): 101-106.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1998. Beach, M.J., and D. Pascoe. The Role of Hydra vulgaris (Pallas) in Assessing the Toxicity of Freshwater Pollutants. Water Res.32(1): 101-106.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	54	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1998. Beach, M.J., and D. Pascoe. The Role of Hydra vulgaris (Pallas) in Assessing the Toxicity of Freshwater Pollutants. Water Res.32(1): 101-106.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	38	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1998. Beach, M.J., and D. Pascoe. The Role of Hydra vulgaris (Pallas) in Assessing the Toxicity of Freshwater Pollutants. Water Res.32(1): 101-106.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	32	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	NR-ZERO	Not Reported	T	9.6		NC	ug/L	LAB	2005. Karntanut, W., and D. Pascoe. Effects of Removing Symbiotic Green Algae on the Response of Hydra viridissima (Pallas 1776) to Metals. Ecotoxicol. Environ. Saf.60(3): 301-305.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	EC50	Tentacles	T	8.8	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	EC50	Tentacles	T	8.6	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	EC50	Tentacles	T	19.8	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	EC50	Tentacles	T	16.1	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	LOEC	Tentacles	T	2	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	LOEC	Tentacles	T	4	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	LOEC	Tentacles	T	8	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	LOEC	Tentacles	T	8	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	LOEC	Tentacles	T	8	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	LOEC	Tentacles	T	8	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	NOEC	Tentacles	T	1	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	NOEC	Tentacles	T	2	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	NOEC	Tentacles	T	4	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	NOEC	Tentacles	T	4	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	NOEC	Tentacles	T	4	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Hydra	Invertebrates	Fresh	Reproduction	NOEC	Tentacles	T	4	NR	NR	ug/L	LAB	1999. Pollino, C.A., and D.A. Holdway. Potential of Two Hydra Species as Standard Toxicity Test Animals. Ecotoxicol. Environ. Saf.43(3): 309-316.
Sulfuric acid copper(2+) salt (1:1)	Invertebrates	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	FIELDA	1989. Clements, W.H., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. The Influence of Water Quality on Macroinvertebrate Community Responses to Copper in Outdoor Experimental Streams. Aquat. Toxicol.14(3): 249-262.
Sulfuric acid copper(2+) salt (1:1)	Invertebrates	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	6	NA	NR	ug/L	FIELDA	1989. Clements, W.H., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. The Influence of Water Quality on Macroinvertebrate Community Responses to Copper in Outdoor Experimental Streams. Aquat. Toxicol.14(3): 249-262.
Sulfuric acid copper(2+) salt (1:1)	Invertebrates	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	FIELDA	1989. Clements, W.H., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. The Influence of Water Quality on Macroinvertebrate Community Responses to Copper in Outdoor Experimental Streams. Aquat. Toxicol.14(3): 249-262.
Sulfuric acid copper(2+) salt (1:1)	Invertebrates	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	FIELDA	1989. Clements, W.H., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. The Influence of Water Quality on Macroinvertebrate Community Responses to Copper in Outdoor Experimental Streams. Aquat. Toxicol.14(3): 249-262.
Sulfuric acid copper(2+) salt (1:1)	Invertebrates	Invertebrates	NR	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	NR	1983. Gorovaya, S.L., and M.S. Borisova. Toxicity of Copper Sulfate to Carp Larva and Fodder Zooplankton. C. A. Sel. -Environ. Pollut.24: 1.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Kidneyshell	Molluscs	Fresh	Mortality	EC50	Not Reported	D	16.3	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Kidneyshell	Molluscs	Fresh	Mortality	EC50	Not Reported	D	72.6	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Kidneyshell	Molluscs	Fresh	Mortality	EC50	Not Reported	D	54.4	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Copper	Kuncho River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	65	NR	NR	ug/L	LAB	1996. Krishnamoorthy, P., and P. Subramanian. Effect of Sublethal Doses of Copper on the Hepatopancreas of the Fresh Water Prawn, Macrobrachium lamarrei lamarrei. Geobios (Jodhpur)23(1): 16-18.
Sulfuric acid copper(2+) salt (1:1)	Lagoon Crab	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	mM	LAB	2009. Otitoloju, A.A., O.K. Elegba, and A.O. Osibona. Biological Responses in Edible Crab, Callinectes amnicola that Could Serve as Markers of Heavy Metals Pollution. Environmentalist (Lausanne)29(1): 37-46.
Sulfuric acid copper(2+) salt (1:1)	Lagoon Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.018	NR	NR	mM	LAB	2009. Otitoloju, A.A., O.K. Elegba, and A.O. Osibona. Biological Responses in Edible Crab, Callinectes amnicola that Could Serve as Markers of Heavy Metals Pollution. Environmentalist (Lausanne)29(1): 37-46.
Sulfuric acid copper(2+) salt (1:1)	Lagoon Crab	Crustaceans	Fresh	Mortality	LC95	Not Reported	T	2.348	NR	NR	mM	LAB	2009. Otitoloju, A.A., O.K. Elegba, and A.O. Osibona. Biological Responses in Edible Crab, Callinectes amnicola that Could Serve as Markers of Heavy Metals Pollution. Environmentalist (Lausanne)29(1): 37-46.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Growth	IC10	Shell	D	6.3	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Growth	IC25	Shell	D	12	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Growth	MATC	Shell	D	8.5	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Growth	NOEC	Shell	D	6.6	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Copper	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	42	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	43	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	55	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	62	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	77	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	87	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	30	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	56	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	18	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	28	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	36.1	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	21.6	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	42	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	43	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	48	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	55	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	77	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	87	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	34	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	36	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	23	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	27	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	29	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	29	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	29	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	31	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	31	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	32	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	33	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	33	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	33	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	36	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	36	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	38	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	38	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	38	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	41	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	41	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	42	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	42	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	32	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	8.1	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	8.7	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	8.8	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	23	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	29	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	29	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	29	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	34	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	34	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	35	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	35	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	45	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	45	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	47	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	48	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	52	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	52	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	13	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	15	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	15	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	17	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	17	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	20	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	20	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	20	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	21	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	23	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	23	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	23	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	24	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.

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Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	28	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	28	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	31	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	31	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	34	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	113	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	114	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	127	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	133	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	144	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	149	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	187	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	196	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	21	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.

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Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	24	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	26	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	27	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	298	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	30	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	30	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	31	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	39	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	43	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	44	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	475	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	53	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	56	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	56	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	58	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	66	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	72	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	75	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	9.9	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	18	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	18	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	18	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	18	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	19	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	20	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	20	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	21	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	21	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	21	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	23	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	23	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	25	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	25	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	32	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	41	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	60	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	IC25	Not Reported	D	8	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Copper	Lamp-Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	130	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	LOEC	Not Reported	D	11	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	MATC	Not Reported	D	8.5	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	NOEC	Not Reported	D	6.6	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	D	45	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	D	189	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Lamp-Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	D	86	NR	NR	ug/L	LAB	2009. Wang, N., C.A. Mebane, J.L. Kunz, C.G. Ingersoll, T.W. May, W.R. Arnold, R.C. Santore, T. Augspurger, F.J. Dwyer, and M.. Evaluation of Acute Copper Toxicity to Juvenile Freshwater Mussels (Fatmucket, Lampsilis siliquoidea) in Natural and Reconstituted Waters. Environ. Toxicol. Chem.28(11): 2367-2377.
Sulfuric acid copper(2+) salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	NR	1989. Yang, T., and F. Zhang. Acute Toxicity of 7 Pesticides on 2 Species of Common Leeches. Chin. Environ Sci (Zhongguo Huanjing Kexue)9(1): 51-55.
Sulfuric acid copper(2+) salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	NR	1989. Yang, T., and F. Zhang. Acute Toxicity of 7 Pesticides on 2 Species of Common Leeches. Chin. Environ Sci (Zhongguo Huanjing Kexue)9(1): 51-55.
Sulfuric acid copper(2+) salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	190	NR	NR	ug/L	NR	1989. Yang, T., and F. Zhang. Acute Toxicity of 7 Pesticides on 2 Species of Common Leeches. Chin. Environ Sci (Zhongguo Huanjing Kexue)9(1): 51-55.
Sulfuric acid copper(2+) salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	86	NR	NR	ug/L	NR	1989. Yang, T., and F. Zhang. Acute Toxicity of 7 Pesticides on 2 Species of Common Leeches. Chin. Environ Sci (Zhongguo Huanjing Kexue)9(1): 51-55.
Copper	Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	360	NR	NR	ug/L	LAB	1998. Gerhardt, A., and C. Palmer. Copper Tolerances of Adenophlebia auriculata (Eaton) 1884 (Insecta: Ephemeroptera) and Burnupia stenochorias Cawston 1932 (Gastropoda: Ancylidae) in Indoor Artificial Streams. Sci. Total Environ.215(3): 217-229.
Copper	Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Gerhardt, A., and C. Palmer. Copper Tolerances of Adenophlebia auriculata (Eaton) 1884 (Insecta: Ephemeroptera) and Burnupia stenochorias Cawston 1932 (Gastropoda: Ancylidae) in Indoor Artificial Streams. Sci. Total Environ.215(3): 217-229.
Copper	Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Gerhardt, A., and C. Palmer. Copper Tolerances of Adenophlebia auriculata (Eaton) 1884 (Insecta: Ephemeroptera) and Burnupia stenochorias Cawston 1932 (Gastropoda: Ancylidae) in Indoor Artificial Streams. Sci. Total Environ.215(3): 217-229.
Copper	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	38400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	48700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	52800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	55300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	55300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	55300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	55300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper chloride (CuCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	52800		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Sulfuric acid copper(2+) salt (1:1)	Liver Elimia, River Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1976. Cairns, J.,Jr., D.I. Messenger, and W.F. Calhoun. Invertebrate Response to Thermal Shock Following Exposure to Acutely Sub-Lethal Concentrations of Chemicals. Arch. Hydrobiol.77(2): 164-175.
Sulfuric acid copper(2+) salt (1:1)	Liver Elimia, River Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	860	NA	NR	ug/L	LAB	1976. Cairns, J.,Jr., D.I. Messenger, and W.F. Calhoun. Invertebrate Response to Thermal Shock Following Exposure to Acutely Sub-Lethal Concentrations of Chemicals. Arch. Hydrobiol.77(2): 164-175.
Sulfuric acid copper(2+) salt (1:1)	Liver Elimia, River Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	440	NA	NR	ug/L	LAB	1983. Paulson, P.C., J.R. Pratt, and J.,Jr. Cairns. Relationship of Alkaline Stress and Acute Copper Toxicity in the Snail Goniobasis livescens (Menke). Bull. Environ. Contam. Toxicol.31(6): 719-726.
Sulfuric acid copper(2+) salt (1:1)	Liver Fluke	Worms	Fresh	Mortality	LOEL	Not Reported	T	3000000	NR	NR	ug/L	LAB	1987. Bielecki, A.. The Effect of Phoschlorine, Carbatox and Copper Sulphate on the Development of Eggs and Hatching of Miracidia in Fasciola hepatica L.. Zool. Pol.34(1-4): 209-220.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Liver Fluke	Worms	Fresh	Mortality	LOEL	Not Reported	T	3000000	NR	NR	ug/L	LAB	1987. Bielecki, A.. The Effect of Phoschlorine, Carbatox and Copper Sulphate on the Development of Eggs and Hatching of Miracidia in Fasciola hepatica L.. Zool. Pol.34(1-4): 209-220.
Sulfuric acid copper(2+) salt (1:1)	Liver Fluke	Worms	Fresh	Mortality	LOEL	Not Reported	T	3000000	NR	NR	ug/L	LAB	1987. Bielecki, A.. The Effect of Phoschlorine, Carbatox and Copper Sulphate on the Development of Eggs and Hatching of Miracidia in Fasciola hepatica L.. Zool. Pol.34(1-4): 209-220.
Sulfuric acid copper(2+) salt (1:1)	Liver Fluke	Worms	Fresh	Mortality	LOEL	Not Reported	T	3000000	NR	NR	ug/L	LAB	1987. Bielecki, A.. The Effect of Phoschlorine, Carbatox and Copper Sulphate on the Development of Eggs and Hatching of Miracidia in Fasciola hepatica L.. Zool. Pol.34(1-4): 209-220.
Copper	Mangrove Oyster	Molluscs	Fresh	Mortality	LC50	Not Reported	T	40000	NA	NR	ug/L	LAB	1978. Chung, K.S.. Acute Toxicity of Cadmium and Copper in the Mangrove Oyster (La Aguda Toxididad de Cadmio y Cobre en la Ostra de Mangre (Crassostrea rhizophrae)). Acta Cient. Venez.29(2): 14.
Copper	Mangrove Oyster	Molluscs	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	1978. Chung, K.S.. Acute Toxicity of Cadmium and Copper in the Mangrove Oyster (La Aguda Toxididad de Cadmio y Cobre en la Ostra de Mangre (Crassostrea rhizophrae)). Acta Cient. Venez.29(2): 14.
Copper	Mangrove Oyster	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1978. Chung, K.S.. Acute Toxicity of Cadmium and Copper in the Mangrove Oyster (La Aguda Toxididad de Cadmio y Cobre en la Ostra de Mangre (Crassostrea rhizophrae)). Acta Cient. Venez.29(2): 14.
Copper hydroxide (Cu(OH)2)	Marsh Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1972. Nishiuchi, Y., and K. Yoshida. Toxicities of Pesticides to Some Fresh Water Snails. Bull.Agric.Chem.Insp.Stn.(Tokyo)12: 86-92.
Sulfuric acid copper(2+) salt (1:1)	Marsh Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	600*	NA	NR	ug/L	LAB	1972. Nishiuchi, Y., and K. Yoshida. Toxicities of Pesticides to Some Fresh Water Snails. Bull.Agric.Chem.Insp.Stn.(Tokyo)12: 86-92.
Copper chloride (CuCl2)	Mayfly	Insects/Spiders	Fresh	Growth	IC25	Not Reported	T	17		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	260	NA	NR	ug/L	FIELDN	1996. Shaw, J.L., and J.P. Manning. Evaluating Macroinvertebrate Population and Community Level Effects in Outdoor Microcosms: Use of In Situ Bioassays and Multivariate Analysis. Environ. Toxicol. Chem.15(5): 608-617.
Copper chloride (CuCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC10	Not Reported	T	61		NC	ug/L	LAB	2000. Van der Geest, H.G., G.D. Greve, A. Kroon, S. Kuijl, M.H.S. Kraak, and W. Admiraal. Sensitivity of Characteristic Riverine Insects, the Caddisfly Cyrnus trimaculatus and the Mayfly Ephoron virgo, to Copper and Diazinon. Environ. Pollut.109: 177-182.
Copper chloride (CuCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC25	Not Reported	T	18		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Copper	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	660	NR	NR	ug/L	LAB	1998. Gerhardt, A., and C. Palmer. Copper Tolerances of Adenophlebia auriculata (Eaton) 1884 (Insecta: Ephemeroptera) and Burnupia stenochorias Cawston 1932 (Gastropoda: Ancylidae) in Indoor Artificial Streams. Sci. Total Environ.215(3): 217-229.
Copper	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	1998. Gerhardt, A., and C. Palmer. Copper Tolerances of Adenophlebia auriculata (Eaton) 1884 (Insecta: Ephemeroptera) and Burnupia stenochorias Cawston 1932 (Gastropoda: Ancylidae) in Indoor Artificial Streams. Sci. Total Environ.215(3): 217-229.
Copper	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	180	NR	NR	ug/L	LAB	1998. Gerhardt, A., and C. Palmer. Copper Tolerances of Adenophlebia auriculata (Eaton) 1884 (Insecta: Ephemeroptera) and Burnupia stenochorias Cawston 1932 (Gastropoda: Ancylidae) in Indoor Artificial Streams. Sci. Total Environ.215(3): 217-229.
Copper	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	D	223	NR	NR	ug/L	LAB	1994. Dobbs, M.G., J.L. Farris, R.J. Reash, D.S. Cherry, and J.,Jr. Cairns. Evaluation of the Resident-Species Procedure for Developing Site-Specific Water Quality Criteria for Copper in Blaine Creek, Kentucky. Environ. Toxicol. Chem.13(6): 963-971.
Copper	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	D	453	NR	NR	ug/L	LAB	1994. Dobbs, M.G., J.L. Farris, R.J. Reash, D.S. Cherry, and J.,Jr. Cairns. Evaluation of the Resident-Species Procedure for Developing Site-Specific Water Quality Criteria for Copper in Blaine Creek, Kentucky. Environ. Toxicol. Chem.13(6): 963-971.
Copper chloride (CuCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	55		NC	ug/L	LAB	2002. Van der Geest, H.G., W.J. Soppe, G.D. Greve, A. Kroon, and M.H.S. Kraak. Combined Effects of Lowered Oxygen and Toxicants (Copper and Diazinon) on the Mayfly Ephoron virgo. Environ. Toxicol. Chem.21(2): 431-436.
Copper chloride (CuCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	77		NC	ug/L	LAB	2000. Van der Geest, H.G., G.D. Greve, A. Kroon, S. Kuijl, M.H.S. Kraak, and W. Admiraal. Sensitivity of Characteristic Riverine Insects, the Caddisfly Cyrnus trimaculatus and the Mayfly Ephoron virgo, to Copper and Diazinon. Environ. Pollut.109: 177-182.
Copper chloride (CuCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	79		NC	ug/L	LAB	2000. Van der Geest, H.G., G.D. Greve, M.E. Boivin, M.H.S. Kraak, and C.A.M. Van Gestel. Mixture Toxicity of Copper and Diazinon to Larvae of the Mayfly (Ephoron virgo) Judging Additivity at Different Effect Levels. Environ. Toxicol. Chem.19(12): 2900-2905.
Copper chloride (CuCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	93		NC	ug/L	LAB	2002. Van der Geest, H.G., W.J. Soppe, G.D. Greve, A. Kroon, and M.H.S. Kraak. Combined Effects of Lowered Oxygen and Toxicants (Copper and Diazinon) on the Mayfly Ephoron virgo. Environ. Toxicol. Chem.21(2): 431-436.
Copper chloride (CuCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	73		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	27		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1525	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4.8	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Nehring, R.B.. Aquatic Insects as Biological Monitors of Heavy Metal Pollution. Bull. Environ. Contam. Toxicol.15(2): 147-154.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	D	201	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	180	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	137		NC	ug/L	LAB	2008. Brinkman, S.F., and W.D. Johnston. Acute Toxicity of Aqueous Copper, Cadmium, and Zinc to the Mayfly Rhithrogena hageni. Arch. Environ. Contam. Toxicol.54(3): 466-472.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	1525	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	4.8	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD0	Not Reported	T	250	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD0	Not Reported	T	0.1	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD100	Not Reported	T	5000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD100	Not Reported	T	25	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Copper hydroxide (Cu(OH)2)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	13000	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Copper hydroxide (Cu(OH)2)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	2800	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Copper hydroxide (Cu(OH)2)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	2300	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	20000	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	13000	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	8800	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	1525	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	6800	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	4.8	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+)salt basic	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	18000	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Sulfuric acid copper(2+)salt basic	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	10000	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Sulfuric acid copper(2+)salt basic	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	2500	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Sulfuric acid copper(2+)salt basic	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	F	670	NR	NR	ug/L	LAB	1979. Nishiuchi, Y., and K. Asano. Toxicity of Agricultural Chemicals to Some Freshwater Organisms - LIX. Suisan Zoshoku27(1): 48-55.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LETC	Not Reported	T	80	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Copper	Mayfly	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper	Mayfly	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	180	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	140	NR	NR	ug/L	LAB	2008. Brinkman, S.F., and W.D. Johnston. Acute Toxicity of Aqueous Copper, Cadmium, and Zinc to the Mayfly Rhithrogena hageni. Arch. Environ. Contam. Toxicol.54(3): 466-472.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	260	NA	NR	ug/L	FIELDN	1996. Shaw, J.L., and J.P. Manning. Evaluating Macroinvertebrate Population and Community Level Effects in Outdoor Microcosms: Use of In Situ Bioassays and Multivariate Analysis. Environ. Toxicol. Chem.15(5): 608-617.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	F	1600	NA	NR	ug/L	LAB	1990. Benton, M.J., and S.I. Guttman. Relationship of Allozyme Genotype to Survivorship of Mayflies (Stenonema femoratum) Exposed to Copper. J. North Am. Benthol. Soc.9(3): 271-276.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	1220	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	630	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	520	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	NR	Mortality	NR-LETH	Not Reported	T	6	NA	NR	ug/L	FIELDN	1989. Leland, H.V., S.V. Fend, T.L. Dudley, and J.L. Carter. Effects of Copper on Species Composition of Benthic Insects in a Sierra Nevada, California, Stream. Freshw. Biol.21(2): 163-179.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	NR	Mortality	NR-LETH	Not Reported	T	6	NA	NR	ug/L	FIELDA	1989. Leland, H.V., S.V. Fend, T.L. Dudley, and J.L. Carter. Effects of Copper on Species Composition of Benthic Insects in a Sierra Nevada, California, Stream. Freshw. Biol.21(2): 163-179.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	NR	Mortality	NR-LETH	Not Reported	T	6	NA	NR	ug/L	FIELDA	1989. Leland, H.V., S.V. Fend, T.L. Dudley, and J.L. Carter. Effects of Copper on Species Composition of Benthic Insects in a Sierra Nevada, California, Stream. Freshw. Biol.21(2): 163-179.
Sulfuric acid copper(2+) salt (1:1)	Mayfly	Insects/Spiders	NR	Mortality	NR-LETH	Not Reported	T	6	NA	NR	ug/L	FIELDN	1989. Leland, H.V., S.V. Fend, T.L. Dudley, and J.L. Carter. Effects of Copper on Species Composition of Benthic Insects in a Sierra Nevada, California, Stream. Freshw. Biol.21(2): 163-179.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Growth	EC50		T	1602000	NA	NR	ug/L	LAB	1987. Kosalwat, P., and A.W. Knight. Chronic Toxicity of Copper to a Partial Life Cycle of the Midge, Chironomus decorus. Arch. Environ. Contam. Toxicol.16(3): 283-290.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Growth	IC25	Not Reported	T	24		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Growth	LOEC	Whole Organism	T	500	NR	NR	ug/L	LAB	2003. Karouna-Renier, N.K., and J.P. Zehr. Short-term Exposures to Chronically Toxic Copper Concentrations Induce HSP70 Proteins in Midge Larvae (Chironomus tentans). Sci. Total Environ.312(1-3): 267-272.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Growth	NOEC	Whole Organism	T	250	NR	NR	ug/L	LAB	2003. Karouna-Renier, N.K., and J.P. Zehr. Short-term Exposures to Chronically Toxic Copper Concentrations Induce HSP70 Proteins in Midge Larvae (Chironomus tentans). Sci. Total Environ.312(1-3): 267-272.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Growth	NOER	Whole Organism	T	146000	NR	NR	ug/L	LAB	2005. Pery, A.R.R., A. Bethune, J. Gahou, R. Mons, and J. Garric. Body Residues: A Key Variable to Analyze Toxicity Tests with Chironomus riparius Exposed to Copper-Spiked Sediments. Ecotoxicol. Environ. Saf.61(2): 160-167.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Growth	NOER	Whole Organism	T	164000	NR	NR	ug/L	LAB	2005. Pery, A.R.R., A. Bethune, J. Gahou, R. Mons, and J. Garric. Body Residues: A Key Variable to Analyze Toxicity Tests with Chironomus riparius Exposed to Copper-Spiked Sediments. Ecotoxicol. Environ. Saf.61(2): 160-167.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Growth	NOER	Whole Organism	T	261000	NR	NR	ug/L	LAB	2005. Pery, A.R.R., A. Bethune, J. Gahou, R. Mons, and J. Garric. Body Residues: A Key Variable to Analyze Toxicity Tests with Chironomus riparius Exposed to Copper-Spiked Sediments. Ecotoxicol. Environ. Saf.61(2): 160-167.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Growth	NOER	Whole Organism	T	152000	NR	NR	ug/L	LAB	2005. Pery, A.R.R., A. Bethune, J. Gahou, R. Mons, and J. Garric. Body Residues: A Key Variable to Analyze Toxicity Tests with Chironomus riparius Exposed to Copper-Spiked Sediments. Ecotoxicol. Environ. Saf.61(2): 160-167.
Copper	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	87	NA	NR	ug/L	LAB	1992. Timmermans, K.R., W. Peeters, and M. Tonkes. Cadmium, Zinc, Lead and Copper in Chironomus riparius (Meigen) Larvae (Diptera, Chironomidae): Uptake and Effects. Hydrobiologia241(2): 119-134.
Copper	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	1996. Watts, M.M., and D. Pascoe. Use of the Freshwater Macroinvertebrate Chironomus riparius (Diptera: Chironomidae) in the Assessment of Sediment Toxicity. Water Sci. Technol.34(7-8): 101-107.
Copper	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	D	119	NR	NR	ug/L	LAB	1996. Watts, M.M., and D. Pascoe. Use of the Freshwater Macroinvertebrate Chironomus riparius (Diptera: Chironomidae) in the Assessment of Sediment Toxicity. Water Sci. Technol.34(7-8): 101-107.
Copper	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	D	148	NR	NR	ug/L	LAB	1996. Watts, M.M., and D. Pascoe. Use of the Freshwater Macroinvertebrate Chironomus riparius (Diptera: Chironomidae) in the Assessment of Sediment Toxicity. Water Sci. Technol.34(7-8): 101-107.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	D	150	NR	NR	ug/L	LAB	1996. Watts, M.M., and D. Pascoe. Use of the Freshwater Macroinvertebrate Chironomus riparius (Diptera: Chironomidae) in the Assessment of Sediment Toxicity. Water Sci. Technol.34(7-8): 101-107.
Copper	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	D	238	NR	NR	ug/L	LAB	1996. Watts, M.M., and D. Pascoe. Use of the Freshwater Macroinvertebrate Chironomus riparius (Diptera: Chironomidae) in the Assessment of Sediment Toxicity. Water Sci. Technol.34(7-8): 101-107.
Copper	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Besser, J.M., J.A. Kubitz, C.G. Ingersoll, W.E. Braselton, and J.P. Giesy. Influences on Copper Bioaccumulation, Growth, and Survival of the Midge, Chironomus tentans, in Metal-Contaminated Sediments. J. Aquat. Ecosyst. Health4(3): 157-168.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Whole Organism	T	35	NR	NR	ug/L	LAB	1999. Stuijfzand, S.C., M.J. Jonker, E. Van Ammelrooy, and W. Admiraal. Species-Specific Responses to Metals in Organically Enriched River Water, with Emphasis on Effects of Humic Acids. Environ. Pollut.106(1): 115-121.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Growth	NR		T	320	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. A Method for Assessing Chronic Effects of Toxic Substances on the Midge, Paratanytarsus parthenogeneticus - Effects of Copper. Arch. Environ. Contam. Toxicol.10(6): 705-713.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Growth	NR		T	640	NA	NR	ug/L	LAB	1981. Hatakeyama, S., and M. Yasuno. A Method for Assessing Chronic Effects of Toxic Substances on the Midge, Paratanytarsus parthenogeneticus - Effects of Copper. Arch. Environ. Contam. Toxicol.10(6): 705-713.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC25	Not Reported	T	41		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	23600	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	3160	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	8590	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	12510	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	2050	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	3760	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1990	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	6260	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	980	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	38400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	48700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	55300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	55300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	55300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	99600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1580	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	2200	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	530	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	13430	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	3400	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	8990	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	9070	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1991. Taylor, E.J., S.J. Maund, and D. Pascoe. Toxicity of Four Common Pollutants to the Freshwater Macroinvertebrates Chironomus riparius Meigen (Insecta: Diptera) and Gammarus pulex (L.). Arch. Environ. Contam. Toxicol.21: 371-376.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1991. Taylor, E.J., S.J. Maund, and D. Pascoe. Toxicity of Four Common Pollutants to the Freshwater Macroinvertebrates Chironomus riparius Meigen (Insecta: Diptera) and Gammarus pulex (L.). Arch. Environ. Contam. Toxicol.21: 371-376.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	D	1170	NR	NR	ug/L	LAB	1994. Dobbs, M.G., J.L. Farris, R.J. Reash, D.S. Cherry, and J.,Jr. Cairns. Evaluation of the Resident-Species Procedure for Developing Site-Specific Water Quality Criteria for Copper in Blaine Creek, Kentucky. Environ. Toxicol. Chem.13(6): 963-971.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	2940	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	3910	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	4220	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1120	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1630	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1860	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1991. Taylor, E.J., S.J. Maund, and D. Pascoe. Toxicity of Four Common Pollutants to the Freshwater Macroinvertebrates Chironomus riparius Meigen (Insecta: Diptera) and Gammarus pulex (L.). Arch. Environ. Contam. Toxicol.21: 371-376.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1260	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1270	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	640	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	10100	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	2700	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	7100	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	54	NA	NR	ug/L	LAB	1995. Phipps, G.L., V.R. Mattson, and G.T. Ankley. Relative Sensitivity of Three Freshwater Benthic Macroinvertebrates to Ten Contaminants. Arch. Environ. Contam. Toxicol.28(3): 281-286.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	2200	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	2400	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	3100	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1350	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	850	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	870	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	310	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	540	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	550	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Copper chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	608	NA	NR	ug/L	LAB	1984. Nebeker, A.V., M.A. Cairns, and C.M. Wise. Relative Sensitivity of Chironomus tentans Life Stages to Copper. Environ. Toxicol. Chem.3(1): 151-158.
Copper chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	77.5	NA	NR	ug/L	LAB	1984. Nebeker, A.V., M.A. Cairns, and C.M. Wise. Relative Sensitivity of Chironomus tentans Life Stages to Copper. Environ. Toxicol. Chem.3(1): 151-158.
Copper chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	77.5	NA	NR	ug/L	LAB	1984. Nebeker, A.V., M.A. Cairns, and C.M. Wise. Relative Sensitivity of Chironomus tentans Life Stages to Copper. Environ. Toxicol. Chem.3(1): 151-158.
Copper chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1446	NA	NR	ug/L	LAB	1984. Nebeker, A.V., M.A. Cairns, and C.M. Wise. Relative Sensitivity of Chironomus tentans Life Stages to Copper. Environ. Toxicol. Chem.3(1): 151-158.
Copper chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1690	NA	NR	ug/L	LAB	1984. Nebeker, A.V., M.A. Cairns, and C.M. Wise. Relative Sensitivity of Chironomus tentans Life Stages to Copper. Environ. Toxicol. Chem.3(1): 151-158.
Copper chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	773	NA	NR	ug/L	LAB	1984. Nebeker, A.V., M.A. Cairns, and C.M. Wise. Relative Sensitivity of Chironomus tentans Life Stages to Copper. Environ. Toxicol. Chem.3(1): 151-158.
Copper chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	298	NA	NR	ug/L	LAB	1984. Nebeker, A.V., M.A. Cairns, and C.M. Wise. Relative Sensitivity of Chironomus tentans Life Stages to Copper. Environ. Toxicol. Chem.3(1): 151-158.
Copper chloride (CuCl)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	79300	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Copper chloride (CuCl)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	31800	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Copper chloride (CuCl)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	21400	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	17200	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Copper chloride (CuCl)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	17300	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Copper chloride (CuCl)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	18900	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6390	NR	NR	ug/L	LAB	1999. Smith, B., M. Kokkinn, and J. Bidwell. A Toxicity Test for Contaminated Australian Freshwater Sediments Using the Larvae of Chironomus maddeni (Diptera: Chironomidae), a Species Native to South Australia. Australas.J.Ecotoxicol.5(1): 11-20.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42600		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	35920	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	47740	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	47740	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	47740	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	47780	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	52070	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	59130	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	59130	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	43		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	70		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	249	NA	NR	ug/L	LAB	1984. Cairns, M.A., A.V. Nebeker, J.H. Gakstatter, and W.L. Griffis. Toxicity of Copper-Spiked Sediments to Freshwater Invertebrates. Environ. Toxicol. Chem.3(3): 435-445.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	428	D	38	ug/L	LAB	1984. Cairns, M.A., A.V. Nebeker, J.H. Gakstatter, and W.L. Griffis. Toxicity of Copper-Spiked Sediments to Freshwater Invertebrates. Environ. Toxicol. Chem.3(3): 435-445.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	16.3	NA	NR	ug/L	LAB	1980. Anderson, R.L., C.T. Walbridge, and J.T. Fiandt. Survival and Growth of Tanytarsus dissimilis (Chironomidae) Exposed to Copper, Cadmium, Zinc, and Lead. Arch. Environ. Contam. Toxicol.9(3): 329-335.
Nitric acid, Copper(2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	100000	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Nitric acid, Copper(2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	31600	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Nitric acid, Copper(2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	20900	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Nitric acid, Copper(2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	17200	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Nitric acid, Copper(2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	18210	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Nitric acid, Copper(2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	19100	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1830	NR	NR	ug/L	LAB	2002. Peck, M.R., D.A. Klessa, and D.J. Baird. A Tropical Sediment Toxicity Test Using the Dipteran Chironomus crassiforceps to Test Metal Bioavailability with Sediment pH Change in Tropical Acid-Sulfate Sediments. Environ. Toxicol. Chem.21(4): 720-728.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3470	NR	NR	ug/L	LAB	2002. Peck, M.R., D.A. Klessa, and D.J. Baird. A Tropical Sediment Toxicity Test Using the Dipteran Chironomus crassiforceps to Test Metal Bioavailability with Sediment pH Change in Tropical Acid-Sulfate Sediments. Environ. Toxicol. Chem.21(4): 720-728.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2002. Peck, M.R., D.A. Klessa, and D.J. Baird. A Tropical Sediment Toxicity Test Using the Dipteran Chironomus crassiforceps to Test Metal Bioavailability with Sediment pH Change in Tropical Acid-Sulfate Sediments. Environ. Toxicol. Chem.21(4): 720-728.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2300	NR	NR	ug/L	LAB	2002. Peck, M.R., D.A. Klessa, and D.J. Baird. A Tropical Sediment Toxicity Test Using the Dipteran Chironomus crassiforceps to Test Metal Bioavailability with Sediment pH Change in Tropical Acid-Sulfate Sediments. Environ. Toxicol. Chem.21(4): 720-728.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	640	NR	NR	ug/L	LAB	2002. Peck, M.R., D.A. Klessa, and D.J. Baird. A Tropical Sediment Toxicity Test Using the Dipteran Chironomus crassiforceps to Test Metal Bioavailability with Sediment pH Change in Tropical Acid-Sulfate Sediments. Environ. Toxicol. Chem.21(4): 720-728.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	739	NA	NR	ug/L	LAB	1987. Kosalwat, P., and A.W. Knight. Acute Toxicity of Aqueous and Substrate-Bound Copper to the Midge, Chironomus decorus. Arch. Environ. Contam. Toxicol.16(3): 275-282.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5830000	NA	NR	ug/L	LAB	1987. Kosalwat, P., and A.W. Knight. Acute Toxicity of Aqueous and Substrate-Bound Copper to the Midge, Chironomus decorus. Arch. Environ. Contam. Toxicol.16(3): 275-282.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7000		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	80500		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	150		NR	ug/L	LAB	2001. Fargasova, A.. Winter Third- to Fourth-Instar Larvae of Chironomus plumosus as Bioassay Tools for Assessment of Acute Toxicity of Metals and Their Binary Combinations. Ecotoxicol. Environ. Saf.48(1): 1-5.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3400	NR	NR	ug/L	LAB	2009. Dornfeld, C.B., M. Moreira-Santos, E.L.G. Espindola, and R. Ribeiro. Do Larvae and Ovipositing Chironomus riparius (Diptera: Chironomidae) Females Avoid Copper-Contaminated Environments?. Hum. Ecol. Risk Assess.15(1): 63-75.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	D	2090	NR	NR	ug/L	LAB	2008. Bechard, K.M., P.L. Gillis, and C.M. Wood. Acute Toxicity of Waterborne Cd, Cu, Pb, Ni, and Zn to First-Instar Chironomus riparius Larvae. Arch. Environ. Contam. Toxicol.54(3): 454-459.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2009. Dornfeld, C.B., M. Moreira-Santos, E.L.G. Espindola, and R. Ribeiro. Do Larvae and Ovipositing Chironomus riparius (Diptera: Chironomidae) Females Avoid Copper-Contaminated Environments?. Hum. Ecol. Risk Assess.15(1): 63-75.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	85640	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1136.5		NC	ug/L	LAB	2000. Mastin, B.J., and J.H.,Jr. Rodgers. Toxicity and Bioavailability of Copper Herbicides (Clearigate, Cutrine-Plus, and Copper Sulfate) to Freshwater Animals. Arch. Environ. Contam. Toxicol.39(4): 445-451.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	74800	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1502	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	36.3	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	61.5	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	31700	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	323	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	529	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5820	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	100*	NA	NR	ug/L	LAB	1986. Ziegenfuss, P.S., W.J. Renaudette, and W.J. Adams. Methodology for Assessing the Acute Toxicity of Chemicals Sorbed to Sediments: Testing the Equilibrium Partitioning Theory. In: T.M.Poston and R.Purdy (Eds.), Aquatic Toxicology and Environmental Fate, 9th Volume, ASTM STP 921, Philadelphia, PA: 479-493.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	29300	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	17100	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	18400	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	18550	NR	NR	ug/L	LAB	2009. Warrin, E., V.J. Vedamanikam, and N.A.M. Shazilli. Toxicity of Three Forms of Copper to the Chironomus tentans in both the Aquatic and Sediment Media. Toxicol. Environ. Chem.91(2): 297-304.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	135	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	57.1	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	630	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	106.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	49.4	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	657	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	54	NA	NR	ug/L	LAB	1993. West, C.W., V.R. Mattson, E.N. Leonard, G.L. Phipps, and G.T. Ankley. Comparison of the Relative Sensitivity of Three Benthic Invertebrates to Copper-Contaminated Sediments from the Keweenaw Waterway. Hydrobiologia262: 57-63.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2050	NA	NR	ug/L	LAB	1988. Hatakeyama, S.. Chronic Effects of Cu on Reproduction of Polypedilum nubifer (Chironomidae) Through Water and Food. Ecotoxicol. Environ. Saf.16(1): 1-10.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	62400	NA	NR	ug/L	LAB	1988. Hatakeyama, S.. Chronic Effects of Cu on Reproduction of Polypedilum nubifer (Chironomidae) Through Water and Food. Ecotoxicol. Environ. Saf.16(1): 1-10.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7910	NA	NR	ug/L	LAB	1988. Hatakeyama, S.. Chronic Effects of Cu on Reproduction of Polypedilum nubifer (Chironomidae) Through Water and Food. Ecotoxicol. Environ. Saf.16(1): 1-10.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1988. Hatakeyama, S.. Chronic Effects of Cu on Reproduction of Polypedilum nubifer (Chironomidae) Through Water and Food. Ecotoxicol. Environ. Saf.16(1): 1-10.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1988. Hatakeyama, S.. Chronic Effects of Cu on Reproduction of Polypedilum nubifer (Chironomidae) Through Water and Food. Ecotoxicol. Environ. Saf.16(1): 1-10.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	630	NA	NR	ug/L	LAB	1988. Hatakeyama, S.. Chronic Effects of Cu on Reproduction of Polypedilum nubifer (Chironomidae) Through Water and Food. Ecotoxicol. Environ. Saf.16(1): 1-10.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	NR	Mortality	LC50	Not Reported	T	3400		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	650	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	30	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC95	Not Reported	T	5500		NR	ug/L	LAB	2001. Fargasova, A.. Winter Third- to Fourth-Instar Larvae of Chironomus plumosus as Bioassay Tools for Assessment of Acute Toxicity of Metals and Their Binary Combinations. Ecotoxicol. Environ. Saf.48(1): 1-5.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	110		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	2400		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	830		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LD90	Not Reported	T	336000		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LD90	Not Reported	T	5300		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LD90	Not Reported	T	8000		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LD90	Not Reported	T	1600		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LD90	Not Reported	T	200		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LD90	Not Reported	T	4000		NC	ug/L	LAB	2002. Halpern, M., A. Gasith, and M. Broza. Does the Tube of a Benthic Chironomid Larva Play a Role in Protecting Its Dweller Against Chemical Toxicants?. Hydrobiologia470(1-3): 49-55.
Copper	Midge	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	1100		NC	ug/L	LAB	2000. Girling, A.E., D. Pascoe, C.R. Janssen, A. Peither, A. Wenzel, H. Schafer, B. Neumeier, G.C. Mitchell, E.J. Taylor, S.J.. Development of Methods for Evaluating Toxicity to Freshwater Ecosystems. Ecotoxicol. Environ. Saf.45(2): 148-176.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	1300	NR	NR	ug/L	LAB	2009. Dornfeld, C.B., M. Moreira-Santos, E.L.G. Espindola, and R. Ribeiro. Do Larvae and Ovipositing Chironomus riparius (Diptera: Chironomidae) Females Avoid Copper-Contaminated Environments?. Hum. Ecol. Risk Assess.15(1): 63-75.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	500	NR	NR	ug/L	LAB	2003. Karouna-Renier, N.K., and J.P. Zehr. Short-term Exposures to Chronically Toxic Copper Concentrations Induce HSP70 Proteins in Midge Larvae (Chironomus tentans). Sci. Total Environ.312(1-3): 267-272.
Copper	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	660		NC	ug/L	LAB	2000. Girling, A.E., D. Pascoe, C.R. Janssen, A. Peither, A. Wenzel, H. Schafer, B. Neumeier, G.C. Mitchell, E.J. Taylor, S.J.. Development of Methods for Evaluating Toxicity to Freshwater Ecosystems. Ecotoxicol. Environ. Saf.45(2): 148-176.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	1300	NR	NR	ug/L	LAB	2009. Dornfeld, C.B., M. Moreira-Santos, E.L.G. Espindola, and R. Ribeiro. Do Larvae and Ovipositing Chironomus riparius (Diptera: Chironomidae) Females Avoid Copper-Contaminated Environments?. Hum. Ecol. Risk Assess.15(1): 63-75.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	ug/L	LAB	2003. Karouna-Renier, N.K., and J.P. Zehr. Short-term Exposures to Chronically Toxic Copper Concentrations Induce HSP70 Proteins in Midge Larvae (Chironomus tentans). Sci. Total Environ.312(1-3): 267-272.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	22.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	36.1	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Copper	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Timmermans, K.R., and P.A. Walker. The Fate of Trace Metals During the Metamorphosis of Chironomids (Diptera, Chironomidae). Environ. Pollut.62(1): 73-85.
Copper	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Besser, J.M., J.A. Kubitz, C.G. Ingersoll, W.E. Braselton, and J.P. Giesy. Influences on Copper Bioaccumulation, Growth, and Survival of the Midge, Chironomus tentans, in Metal-Contaminated Sediments. J. Aquat. Ecosyst. Health4(3): 157-168.
Copper chloride (CuCl)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	0.83	NR	NR	ug/L	LAB	1997. Fargasova, A.. Sensitivity of Chironomus plumosus Larvae to V5+, Mo6+, Mn2+, Ni2+, Cu2+, and Cu+ Metal Ions and Their Combinations. Bull. Environ. Contam. Toxicol.59(1): 956-962.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5071	NA	NR	ug/L	LAB	1987. Kosalwat, P., and A.W. Knight. Chronic Toxicity of Copper to a Partial Life Cycle of the Midge, Chironomus decorus. Arch. Environ. Contam. Toxicol.16(3): 283-290.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	0.091	NR	NR	ug/L	LAB	1997. Fargasova, A.. Sensitivity of Chironomus plumosus Larvae to V5+, Mo6+, Mn2+, Ni2+, Cu2+, and Cu+ Metal Ions and Their Combinations. Bull. Environ. Contam. Toxicol.59(1): 956-962.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Janssens de Bisthoven, L., A. Vermeulen, and F. Ollevier. Experimental Induction of Morphological Deformities in Chironomus riparius Larvae by Chronic Exposure to Copper and Lead. Arch. Environ. Contam. Toxicol.35: 249-256.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	3000	NA	NR	ug/L	LAB	1985. Gauss, J.D., P.E. Woods, R.W. Winner, and J.H. Skillings. Acute Toxicity of Copper to Three Life Stages of Chironomus tentans as Affected by Water Hardness-Alkalinity. Environ. Pollut. A.37(2): 149-157.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1985. Gauss, J.D., P.E. Woods, R.W. Winner, and J.H. Skillings. Acute Toxicity of Copper to Three Life Stages of Chironomus tentans as Affected by Water Hardness-Alkalinity. Environ. Pollut. A.37(2): 149-157.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1985. Gauss, J.D., P.E. Woods, R.W. Winner, and J.H. Skillings. Acute Toxicity of Copper to Three Life Stages of Chironomus tentans as Affected by Water Hardness-Alkalinity. Environ. Pollut. A.37(2): 149-157.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	1000		NR	ug/L	LAB	2001. Fargasova, A.. Winter Third- to Fourth-Instar Larvae of Chironomus plumosus as Bioassay Tools for Assessment of Acute Toxicity of Metals and Their Binary Combinations. Ecotoxicol. Environ. Saf.48(1): 1-5.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	2003. Karouna-Renier, N.K., and J.P. Zehr. Short-term Exposures to Chronically Toxic Copper Concentrations Induce HSP70 Proteins in Midge Larvae (Chironomus tentans). Sci. Total Environ.312(1-3): 267-272.
Copper chloride (CuCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	35	NR	NR	ug/L	LAB	1999. Stuijfzand, S.C., M.J. Jonker, E. Van Ammelrooy, and W. Admiraal. Species-Specific Responses to Metals in Organically Enriched River Water, with Emphasis on Effects of Humic Acids. Environ. Pollut.106(1): 115-121.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	1100	NR	NR	ug/L	LAB	2009. Dornfeld, C.B., M. Moreira-Santos, E.L.G. Espindola, and R. Ribeiro. Do Larvae and Ovipositing Chironomus riparius (Diptera: Chironomidae) Females Avoid Copper-Contaminated Environments?. Hum. Ecol. Risk Assess.15(1): 63-75.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	2700	NR	NR	ug/L	LAB	2009. Dornfeld, C.B., M. Moreira-Santos, E.L.G. Espindola, and R. Ribeiro. Do Larvae and Ovipositing Chironomus riparius (Diptera: Chironomidae) Females Avoid Copper-Contaminated Environments?. Hum. Ecol. Risk Assess.15(1): 63-75.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	2700	NR	NR	ug/L	LAB	2009. Dornfeld, C.B., M. Moreira-Santos, E.L.G. Espindola, and R. Ribeiro. Do Larvae and Ovipositing Chironomus riparius (Diptera: Chironomidae) Females Avoid Copper-Contaminated Environments?. Hum. Ecol. Risk Assess.15(1): 63-75.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Reproduction	LOEC	Egg	T	1300	NR	NR	ug/L	LAB	2009. Dornfeld, C.B., M. Moreira-Santos, E.L.G. Espindola, and R. Ribeiro. Do Larvae and Ovipositing Chironomus riparius (Diptera: Chironomidae) Females Avoid Copper-Contaminated Environments?. Hum. Ecol. Risk Assess.15(1): 63-75.
Sulfuric acid copper(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Reproduction	NOEC	Not Reported	T	1300	NR	NR	ug/L	LAB	2009. Dornfeld, C.B., M. Moreira-Santos, E.L.G. Espindola, and R. Ribeiro. Do Larvae and Ovipositing Chironomus riparius (Diptera: Chironomidae) Females Avoid Copper-Contaminated Environments?. Hum. Ecol. Risk Assess.15(1): 63-75.
Copper	Mollusk Phylum	Molluscs	NR	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1987. Zhokhov, A.E.. Effect of the Pollution of Water-Bodies on Life Cycles in Trematodes. C. A. Sel. -Environ. Pollut.17: 1 p..
Copper	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	47	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	62	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	63	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	73	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	83	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	24	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	29	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	38	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	16	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	16	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	23	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	D	31	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	D	15.9	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	62	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	83	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	35	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	35	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	53	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	53	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	59	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	59	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	66	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	66	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	20	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	20	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	23	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	23	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	31	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	31	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	32	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	32	NR	NR	ug/L	LAB	2007. Wang, N., T. Augspurger, M.C. Barnhart, J.R. Bidwell, W.G. Cope, F.J. Dwyer, S. Geis, I.E. Greer, C.G. Ingersoll, C.M. K. Intra- and Interlaboratory Variability in Acute Toxicity Tests with Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2029-2035.
Copper hydroxide (Cu(OH)2)	Mud Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1972. Nishiuchi, Y., and K. Yoshida. Toxicities of Pesticides to Some Fresh Water Snails. Bull.Agric.Chem.Insp.Stn.(Tokyo)12: 86-92.
Sulfuric acid copper(2+) salt (1:1)	Mud Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	920*	NA	NR	ug/L	LAB	1972. Nishiuchi, Y., and K. Yoshida. Toxicities of Pesticides to Some Fresh Water Snails. Bull.Agric.Chem.Insp.Stn.(Tokyo)12: 86-92.
Copper	Mussel	Molluscs	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1991. Raj, A.I.M., and P.S. Hameed. Effect of Copper, Cadmium and Mercury on Metabolism of the Freshwater Mussel Lamellidens marginalis (Lamarck). J. Environ. Biol.12(2): 131-135.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	8951.5	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	7013.2	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	4396.6	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	2106.8	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Copper	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1989. Hameed, P.S., and A.I.M. Raj. Effects of Copper, Cadmium and Mercury on Crystalline Style of the Freshwater Mussel Lamellidens marginalis (Lamarck). Indian J. Environ. Health31(2): 131-136.
Copper	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1991. Raj, A.I.M., and P.S. Hameed. Effect of Copper, Cadmium and Mercury on Metabolism of the Freshwater Mussel Lamellidens marginalis (Lamarck). J. Environ. Biol.12(2): 131-135.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	171	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	388	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	199	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	86	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3990	NR	NR	ug/L	LAB	2006. Satyaparameshwar, K., T.R. Reddy, and N.V. Kumar. Study of Carbohydrate Metabolism in Selected Tissues of Freshwater Mussel, Lamellidens marginalis Under Copper Sulphate Toxicity. J. Environ. Biol.27(1): 39-41.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11580	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8907.5	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	6882.5	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3797	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	44	NA	NR	ug/L	LAB	1993. Jacobson, P.J., J.L. Farris, D.S. Cherry, and R.J. Neves. Juvenile Freshwater Mussel (Bivalvia: Unionidae) Responses to Acute Toxicity Testing with Copper. Environ. Toxicol. Chem.12: 879-883.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	44	NA	NR	ug/L	LAB	1993. Jacobson, P.J., J.L. Farris, D.S. Cherry, and R.J. Neves. Juvenile Freshwater Mussel (Bivalvia: Unionidae) Responses to Acute Toxicity Testing with Copper. Environ. Toxicol. Chem.12: 879-883.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	347	NR	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	46	NR	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7800	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	25	NR	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	2000		NC	ug/L	LAB	2007. Loayza-Muro, R., and R. Elias-Letts. Responses of the Mussel Anodontites trapesialis (Unionidae) to Environmental Stressors: Effect of pH, Temperature and Metals on Filtration Rate. Environ. Pollut.149(2): 209-215.
Sulfuric acid copper(2+) salt (1:1)	Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	30	NA	NR	ug/L	LAB	1997. Doyotte, A., C. Cossu, M.C. Jacquin, M. Babut, and P. Vasseur. Antioxidant Enzymes, Glutathione and Lipid Peroxidation as Relevant Biomarkers of Experimental or Field Exposure in the Gills and the Digestive Gland of the Freshwater Bivalve Unio tumidus. Aquat. Toxicol.39: 93-110.
Copper	Mussel	Molluscs	NR	Reproduction	NR	Egg	T	20	NA	NR	ug/L	LAB	1986. Shi, J., and J. Yu. A Preliminary Study of Influences of Several Heavy Metal Ions on the Development of Early Embryo of Thick Shell Mussel (Mytilus coruscus Gould). Donghai Mar. Sci. (Donghai Haiyang)4(1): 46-50.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Growth	EC50	Not Reported	T	56		NC	uM	LAB	2001. Anderson, G.L., W.A. Boyd, and P.L. Williams. Assessment of Sublethal Endpoints for Toxicity Testing with the Nematode Caenorhabditis elegans. Environ. Toxicol. Chem.20(4): 833-838.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Hoss, S., M. Haitzer, W. Traunspurger, H. Gratzer, W. Ahlf, and C. Steinberg. Influence of Particle Size Distribution and Content of Organic Matter on the Toxicity of Copper in Sediment Bioassays Using Caenorhabditis elegans (Nematoda). Water Air Soil Pollut.99(1-4): 689-695.
Copper	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	63000	NR	NR	ug/L	LAB	2005. Graves, A.L., W.A. Boyd, and P.L. Williams. Using Transgenic Caenorhabditis elegans in Soil Toxicity Testing. Arch. Environ. Contam. Toxicol.48(4): 490-494.
Copper	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	69000	NR	NR	ug/L	LAB	2005. Graves, A.L., W.A. Boyd, and P.L. Williams. Using Transgenic Caenorhabditis elegans in Soil Toxicity Testing. Arch. Environ. Contam. Toxicol.48(4): 490-494.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	85400		NC	ug/L	LAB	2003. Boyd, W.A., and P.L. Williams. Comparison of the Sensitivity of Three Nematode Species to Copper and Their Utility in Aquatic and Soil Toxicity Tests. Environ. Toxicol. Chem.22(11): 2768-2774.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1.42	L	1.33	mmol/L	LAB	1997. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Predicting Relative Metal Toxicity with Ion Characteristics: Caenorhabditis elegans LC50. Aquat. Toxicol.39(3-4): 279-290.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	13500	NR	NR	ug/L	LAB	1994. Stringham, E.G., and E.P.M. Candido. Transgenic hsp16-lacZ Strains of the Soil Nematode Caenorhabditis elegans as Biological Monitors of Environmental Stress. Environ. Toxicol. Chem.13(8): 1211-1220.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Donkin, S.G., and P.L. Williams. Influence of Developmental Stage, Salts and Food Presence on Various End Points Using Caenorhabditis elegans for Aquatic Toxicity Testing. Environ. Toxicol. Chem.14(12): 2139-2147.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Donkin, S.G., and P.L. Williams. Influence of Developmental Stage, Salts and Food Presence on Various End Points Using Caenorhabditis elegans for Aquatic Toxicity Testing. Environ. Toxicol. Chem.14(12): 2139-2147.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	91000		NR	ug/L	LAB	2000. Dhawan, R., D.B. Dusenbery, and P.L. Williams. A Comparison of Metal-Induced Lethality and Behavioral Responses in the Nematode Caenorhabditis elegans. Environ. Toxicol. Chem.19(12): 3061-3067.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	6000	NR	NR	ug/L	LAB	1994. Stringham, E.G., and E.P.M. Candido. Transgenic hsp16-lacZ Strains of the Soil Nematode Caenorhabditis elegans as Biological Monitors of Environmental Stress. Environ. Toxicol. Chem.13(8): 1211-1220.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	6400	NA	NR	ug/L	LAB	1995. Donkin, S.G., and P.L. Williams. Influence of Developmental Stage, Salts and Food Presence on Various End Points Using Caenorhabditis elegans for Aquatic Toxicity Testing. Environ. Toxicol. Chem.14(12): 2139-2147.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	18900		NC	ug/L	LAB	2003. Boyd, W.A., and P.L. Williams. Comparison of the Sensitivity of Three Nematode Species to Copper and Their Utility in Aquatic and Soil Toxicity Tests. Environ. Toxicol. Chem.22(11): 2768-2774.
Nitric acid, Copper(2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1.71	L	1.57	mM	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	960	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	640	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	520	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	460	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	420	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1400	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	870	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	640	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	520	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	470	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	440	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LOEC	Not Reported	T	52000		NR	ug/L	LAB	2000. Dhawan, R., D.B. Dusenbery, and P.L. Williams. A Comparison of Metal-Induced Lethality and Behavioral Responses in the Nematode Caenorhabditis elegans. Environ. Toxicol. Chem.19(12): 3061-3067.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LOEL	Not Reported	T	0.3		NC	mM	LAB	2005. Ved, R., S. Saha, B. Westlund, C. Perier, L. Burnam, A. Sluder, M. Hoener, C.M.P. Rodrigues, A. Alfonso, C. Steer, L. Li. Similar Patterns of Mitochondrial Vulnerability and Rescue Induced by Genetic Modification of alpha-Synuclein, Parkin, and DJ-1 in Caenorhabditis elegans. J. Biol. Chem.280(52): 42655-42668.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LOEL	Not Reported	T	0.3		NC	mM	LAB	2005. Ved, R., S. Saha, B. Westlund, C. Perier, L. Burnam, A. Sluder, M. Hoener, C.M.P. Rodrigues, A. Alfonso, C. Steer, L. Li. Similar Patterns of Mitochondrial Vulnerability and Rescue Induced by Genetic Modification of alpha-Synuclein, Parkin, and DJ-1 in Caenorhabditis elegans. J. Biol. Chem.280(52): 42655-42668.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LOEL	Not Reported	T	0.3		NC	mM	LAB	2005. Ved, R., S. Saha, B. Westlund, C. Perier, L. Burnam, A. Sluder, M. Hoener, C.M.P. Rodrigues, A. Alfonso, C. Steer, L. Li. Similar Patterns of Mitochondrial Vulnerability and Rescue Induced by Genetic Modification of alpha-Synuclein, Parkin, and DJ-1 in Caenorhabditis elegans. J. Biol. Chem.280(52): 42655-42668.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LOEL	Not Reported	T	0.3		NC	mM	LAB	2005. Ved, R., S. Saha, B. Westlund, C. Perier, L. Burnam, A. Sluder, M. Hoener, C.M.P. Rodrigues, A. Alfonso, C. Steer, L. Li. Similar Patterns of Mitochondrial Vulnerability and Rescue Induced by Genetic Modification of alpha-Synuclein, Parkin, and DJ-1 in Caenorhabditis elegans. J. Biol. Chem.280(52): 42655-42668.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	LOEL	Not Reported	T	0.75		NC	mM	LAB	2005. Ved, R., S. Saha, B. Westlund, C. Perier, L. Burnam, A. Sluder, M. Hoener, C.M.P. Rodrigues, A. Alfonso, C. Steer, L. Li. Similar Patterns of Mitochondrial Vulnerability and Rescue Induced by Genetic Modification of alpha-Synuclein, Parkin, and DJ-1 in Caenorhabditis elegans. J. Biol. Chem.280(52): 42655-42668.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	LOEL	Not Reported	T	100		NC	ug/L	LAB	1972. Pitcher, R.S., and D.G. McNamara. The Toxicity of Low Concentrations of Silver and Cupric Ions to Three Species of Plant-Parasitic Nematodes. Nematologica18: 385-390.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	NOEC	Not Reported	T	10500	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	NOEL	Not Reported	T	0.75		NC	mM	LAB	2005. Ved, R., S. Saha, B. Westlund, C. Perier, L. Burnam, A. Sluder, M. Hoener, C.M.P. Rodrigues, A. Alfonso, C. Steer, L. Li. Similar Patterns of Mitochondrial Vulnerability and Rescue Induced by Genetic Modification of alpha-Synuclein, Parkin, and DJ-1 in Caenorhabditis elegans. J. Biol. Chem.280(52): 42655-42668.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Mortality	NOEL	Not Reported	T	0.75		NC	mM	LAB	2005. Ved, R., S. Saha, B. Westlund, C. Perier, L. Burnam, A. Sluder, M. Hoener, C.M.P. Rodrigues, A. Alfonso, C. Steer, L. Li. Similar Patterns of Mitochondrial Vulnerability and Rescue Induced by Genetic Modification of alpha-Synuclein, Parkin, and DJ-1 in Caenorhabditis elegans. J. Biol. Chem.280(52): 42655-42668.
Sulfuric acid copper(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Reproduction	EC10	Not Reported	T	2170	NR	NR	ug/L	LAB	2004. Jonker, M.J., A.M. Piskiewicz, N.I. Castella, and J.E. Kammenga. Toxicity of Binary Mixtures of Cadmium-Copper and Carbendazim-Copper to the Nematode Caenorhabditis elegans. Environ. Toxicol. Chem.23(6): 1529-1537.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Reproduction	EC20	Not Reported	T	47.8	NA	NR	uM	LAB	1996. Kammenga, J.E., and J.A.G. Riksen. Comparing Differences in Species Sensitivity to Toxicants: Phenotypic Plasticity Versus Concentration-Response Relationships. Environ. Toxicol. Chem.15(9): 1649-1653.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Reproduction	EC50	Not Reported	T	39		NC	uM	LAB	2001. Anderson, G.L., W.A. Boyd, and P.L. Williams. Assessment of Sublethal Endpoints for Toxicity Testing with the Nematode Caenorhabditis elegans. Environ. Toxicol. Chem.20(4): 833-838.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Reproduction	EC50	Not Reported	T	2040		NC	ug/L	LAB	2003. Boyd, W.A., and P.L. Williams. Comparison of the Sensitivity of Three Nematode Species to Copper and Their Utility in Aquatic and Soil Toxicity Tests. Environ. Toxicol. Chem.22(11): 2768-2774.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Reproduction	EC50	Not Reported	T	138	NR	NR	uM	LAB	1996. Kammenga, J.E., and J.A.G. Riksen. Comparing Differences in Species Sensitivity to Toxicants: Phenotypic Plasticity Versus Concentration-Response Relationships. Environ. Toxicol. Chem.15(9): 1649-1653.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Reproduction	EC50	Not Reported	T	2210		NC	ug/L	LAB	2003. Boyd, W.A., and P.L. Williams. Comparison of the Sensitivity of Three Nematode Species to Copper and Their Utility in Aquatic and Soil Toxicity Tests. Environ. Toxicol. Chem.22(11): 2768-2774.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Reproduction	NR	Not Reported	T	131	NR	NR	uM	LAB	1996. Kammenga, J.E., and J.A.G. Riksen. Comparing Differences in Species Sensitivity to Toxicants: Phenotypic Plasticity Versus Concentration-Response Relationships. Environ. Toxicol. Chem.15(9): 1649-1653.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Reproduction	NR	Not Reported	T	72.8	NR	NR	uM	LAB	1996. Kammenga, J.E., and J.A.G. Riksen. Comparing Differences in Species Sensitivity to Toxicants: Phenotypic Plasticity Versus Concentration-Response Relationships. Environ. Toxicol. Chem.15(9): 1649-1653.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Reproduction	NR	Not Reported	T	31.4	NA	NR	uM	LAB	1996. Kammenga, J.E., and J.A.G. Riksen. Comparing Differences in Species Sensitivity to Toxicants: Phenotypic Plasticity Versus Concentration-Response Relationships. Environ. Toxicol. Chem.15(9): 1649-1653.
Copper chloride (CuCl2)	Nematode	Worms	Fresh	Reproduction	NR	Not Reported	T	17.5	NA	NR	uM	LAB	1996. Kammenga, J.E., and J.A.G. Riksen. Comparing Differences in Species Sensitivity to Toxicants: Phenotypic Plasticity Versus Concentration-Response Relationships. Environ. Toxicol. Chem.15(9): 1649-1653.
Copper chloride (CuCl2)	Nematode Phylum	Worms	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Copper chloride (CuCl2)	Nematode Phylum	Worms	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Copper chloride (CuCl2)	Nematode Phylum	Worms	Fresh	Mortality	LC50	Not Reported	T	490	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Nematode Phylum	Worms	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Copper	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	41	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	9	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	60	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	19	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	43	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	43	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Sulfuric acid copper(2+) salt (1:1)	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	41	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	37	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	60	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	19	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	23	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Neosho Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	43	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Northern Riffleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	D	13.3	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Northern Riffleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	D	8.7	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	2600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	1650	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	2600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	2005. Das, B.K., and N. Das. Impacts of Quicklime (CaO) on the Toxicity of Copper (CuSO4, 5H2O) to Fish and Fish Food Organisms. Chemosphere61(2): 186-191.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	260*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	280*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	340*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Copper	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	2300	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Copper	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	90	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Learner, M.A., and R.W. Edwards. The Toxicity of Some Substances to Nais (Oligochaeta). Soc. Water Treat. Exam.12(3): 161-168.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Learner, M.A., and R.W. Edwards. The Toxicity of Some Substances to Nais (Oligochaeta). Soc. Water Treat. Exam.12(3): 161-168.
Copper	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	35	NA	NR	ug/L	LAB	1995. Phipps, G.L., V.R. Mattson, and G.T. Ankley. Relative Sensitivity of Three Freshwater Benthic Macroinvertebrates to Ten Contaminants. Arch. Environ. Contam. Toxicol.28(3): 281-286.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.000156		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.000157		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.00146		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.00185		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.0021		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.00377		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.0102		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.0199		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.0199		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.0283		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.0295		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.0405		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.0634		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.0672		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.0708		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.138		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.251		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.446		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.467		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1.32		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1.66		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	2.07		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	2.15		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	2.98		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Copper chloride (CuCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	2.99		NC	uM	LAB	2002. Meyer, J.S., C.J. Boese, and S.A. Collyard. Whole-Body Accumulation of Copper Predicts Acute Toxicity to an Aquatic Oligochaete (Lumbriculus variegatus) as pH and Calcium are Varied. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 99-109.
Nitric acid, Copper(2+) salt	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Copper(2+) salt	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Copper(2+) salt	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.45		NR	uM	LAB	2004. O'Gara, B.A., V.K. Bohannon, M.W. Teague, and M.B. Smeaton. Copper-Induced Changes in Locomotor Behaviors and Neuronal Physiology of the Freshwater Oligochaete, Lumbriculus variegatus. Aquat. Toxicol.69(1): 51-66.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	230	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	130*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	35	NA	NR	ug/L	LAB	1993. West, C.W., V.R. Mattson, E.N. Leonard, G.L. Phipps, and G.T. Ankley. Comparison of the Relative Sensitivity of Three Benthic Invertebrates to Copper-Contaminated Sediments from the Keweenaw Waterway. Hydrobiologia262: 57-63.
Sulfuric acid copper(2+) salt (1:1)	Oligochaete, Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	1.6	NR	NR	uM	LAB	2004. O'Gara, B.A., V.K. Bohannon, M.W. Teague, and M.B. Smeaton. Copper-Induced Changes in Locomotor Behaviors and Neuronal Physiology of the Freshwater Oligochaete, Lumbriculus variegatus. Aquat. Toxicol.69(1): 51-66.
Sulfuric acid copper(2+) salt (1:1)	Onyx Rock Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Reed-Judkins, D.K., J.L. Farris, D.S. Cherry, A.G. Heath, and J.,Jr. Cairns. Functional Responses in Leptoxis praerosa to Increasing Metal Concentration and Exposure Duration. Environ. Toxicol. Chem.16(8): 1666-1676.
Sulfuric acid copper(2+) salt (1:1)	Onyx Rock Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Reed-Judkins, D.K., J.L. Farris, D.S. Cherry, A.G. Heath, and J.,Jr. Cairns. Functional Responses in Leptoxis praerosa to Increasing Metal Concentration and Exposure Duration. Environ. Toxicol. Chem.16(8): 1666-1676.
Sulfuric acid copper(2+) salt (1:1)	Onyx Rock Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	75	NA	NR	ug/L	LAB	1997. Reed-Judkins, D.K., J.L. Farris, D.S. Cherry, A.G. Heath, and J.,Jr. Cairns. Functional Responses in Leptoxis praerosa to Increasing Metal Concentration and Exposure Duration. Environ. Toxicol. Chem.16(8): 1666-1676.
Sulfuric acid copper(2+) salt (1:1)	Orb-Shell Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	48000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Orb-Shell Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5500	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Orb-Shell Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5500	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Copper	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13581	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Copper	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12200	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Copper	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5363	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Copper	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	277.3	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Sulfuric acid copper(2+) salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	780		NC	ug/L	LAB	1995. Brooks, A., R.M. White, and D.C. Paton. Effects of Heavy Metals on the Survival of Diacypris compacta (Herbst) (Ostracoda) from the Coorong, South Australia. Int. J. Salt Lake Res.4(2): 133-163.
Sulfuric acid copper(2+) salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	420		NC	ug/L	LAB	1995. Brooks, A., R.M. White, and D.C. Paton. Effects of Heavy Metals on the Survival of Diacypris compacta (Herbst) (Ostracoda) from the Coorong, South Australia. Int. J. Salt Lake Res.4(2): 133-163.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Growth	IC10	Shell	D	5.5	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Growth	IC25	Shell	D	7.6	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Growth	LOEC	Shell	D	6.7	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Growth	MATC	Shell	D	4.6	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Growth	NOEC	Shell	D	3.1	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Copper	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	22	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	47	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	19	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	14	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	15	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	18	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	19	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	16	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	17	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	22	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	47	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	15	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	5.9	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	10	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	19	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	26	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	17	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	6.8	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	IC25	Not Reported	D	7.6	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	75	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	LOEC	Not Reported	D	13	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	MATC	Not Reported	D	9.3	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	NOEC	Not Reported	D	6.7	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Oyster Mussel	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	D	23	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Copper	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	520	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1280	NR	NR	ug/L	LAB	1996. McKinney, A.D., R.G. Hudson, and M.L. Barfield. Species Specificity and Effect of pH on the Response of Freshwater Mussel Juveniles to Acute Copper Toxicity. J. Shellfish Res.15(2): 528.
Copper	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2750	NR	NR	ug/L	LAB	1996. McKinney, A.D., R.G. Hudson, and M.L. Barfield. Species Specificity and Effect of pH on the Response of Freshwater Mussel Juveniles to Acute Copper Toxicity. J. Shellfish Res.15(2): 528.
Nitric acid, Copper(2+) salt	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	76	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Nitric acid, Copper(2+) salt	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	85	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	25.88	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	47.08	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	63.65	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	81.91	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	124.3	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	47.2	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	22.45	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	23.51	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	23.9	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	18.5	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	23.6	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	24.6	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	38	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	41	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	72	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	79	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Copper	Paper Pondshell	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	145	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Copper chloride	Penaeidean Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Growth	LOEC	Not Reported	T	8.8	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC5	Not Reported	T	2780	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC5	Not Reported	T	2730	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC5	Not Reported	T	2780	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC5	Not Reported	T	1780	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	19240	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	13260	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11660	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8840	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC95	Not Reported	T	133360	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC95	Not Reported	T	64520	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC95	Not Reported	T	48930	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC95	Not Reported	T	43840	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Pheasantshell, Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	132	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	42	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	67	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	93	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	51	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	24	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	25	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Copper chloride (CuCl2)	Pine Wilt Nematode	Worms	Fresh	Mortality	LD50	Not Reported	T	3.4E-06	NR	NR	M	LAB	1984. Kobamoto, N., and Y. Izumi. The Nematicidal Effect of Metal Ions on the Pine Wood Nematode, Bursaphelenchus xylophilus. J. Pestic. Sci.9(3): 527-529.
Sulfuric acid copper(2+) salt (1:1)	Pine Wilt Nematode	Worms	Fresh	Mortality	LD50	Not Reported	T	0.00001	NR	NR	M	LAB	1984. Kobamoto, N., and Y. Izumi. The Nematicidal Effect of Metal Ions on the Pine Wood Nematode, Bursaphelenchus xylophilus. J. Pestic. Sci.9(3): 527-529.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Pink Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	34	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Pink Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	13	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Sulfuric acid copper(2+) salt (1:1)	Pink Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	34	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Pink Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Pink Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	14	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Pink Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	38	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Pink Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	13	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Pink Mucket	Molluscs	Fresh	Mortality	EC50	Not Reported	T	37	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Copper	Pink Papershell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	65	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Pink Papershell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	11	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Pink Papershell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	13	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Sulfuric acid copper(2+) salt (1:1)	Pink Papershell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	65	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Pink Papershell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	14	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Pink Papershell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	13	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Copper	Plain Pocketbook	Molluscs	Fresh	Mortality	LC50	Not Reported	T	210	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Copper	Plain Pocketbook	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	85	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Nitric acid, Copper(2+) salt	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	470	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Sulfuric acid copper(2+) salt (1:1)	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	470	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Pond Snail	Molluscs	Fresh	Growth	LOEC	Soft Tissue	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Copper	Pond Snail	Molluscs	Fresh	Growth	LOEC	Soft Tissue	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Copper	Pond Snail	Molluscs	Fresh	Growth	LOEC	Whole Organism	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Copper	Pond Snail	Molluscs	Fresh	Growth	LOEC	Whole Organism	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Copper	Pond Snail	Molluscs	Fresh	Growth	LOEC	Whole Organism	T	136	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Growth	LOEC	Not Reported	D	16.71	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Growth	LOEC	Not Reported	D	16.71	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Growth	LOEC	Not Reported	D	16.71	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Copper	Pond Snail	Molluscs	Fresh	Growth	LOEL	Whole Organism	T	136	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Growth	LOEL	Whole Organism	T	175	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Growth	NOEC	Soft Tissue	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Copper	Pond Snail	Molluscs	Fresh	Growth	NOEC	Whole Organism	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Copper	Pond Snail	Molluscs	Fresh	Growth	NOEC	Whole Organism	T	122	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Growth	NOEC	Whole Organism	T	132	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Growth	NOEC	Whole Organism	T	175	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Growth	NOEC	Whole Organism	T	56	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Growth	NOEC	Whole Organism	T	62	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	D	16.71	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	D	8.84	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	D	16.71	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	D	8.84	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	D	16.71	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	D	8.84	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Copper	Pond Snail	Molluscs	Fresh	Growth	NOEL	Whole Organism	T	122	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Growth	NOEL	Whole Organism	T	132	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Growth	NOEL	Whole Organism	T	56	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Growth	NOEL	Whole Organism	T	62	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	169	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	102	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	102	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	150*	NA	NR	ug/L	LAB	1981. Goel, H.C., and C.P. Srivastava. Laboratory Evaluation of Some Molluscicides Against Fresh Water Snails, Indoplanorbis and Lymnaea Species. J. Commun. Dis.13(2): 121-127.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	49	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	49	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	39	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	34	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	34	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1976. Cairns, J.,Jr., D.I. Messenger, and W.F. Calhoun. Invertebrate Response to Thermal Shock Following Exposure to Acutely Sub-Lethal Concentrations of Chemicals. Arch. Hydrobiol.77(2): 164-175.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	860	NA	NR	ug/L	LAB	1976. Cairns, J.,Jr., D.I. Messenger, and W.F. Calhoun. Invertebrate Response to Thermal Shock Following Exposure to Acutely Sub-Lethal Concentrations of Chemicals. Arch. Hydrobiol.77(2): 164-175.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	902	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	796*	NA	NR	ug/L	LAB	1979. Chowdary, V.D., P.V. Rao, and R. Narayanan. Effect of Copper Sulfate and Sodium Pentachlorophenate on Adenine and Andenosine Phosphates in Lymnaea luteola (Mollusca: Gastropoda). Bull. Environ. Contam. Toxicol.23(4-5): 615-619.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	81	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	491	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	52	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	341	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	27	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	27	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	172	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	410	NR	NR	ug/L	LAB	2006. Ragab, F.M.A., and N.M. Shoukry. Influence of Certain Fertilizers on the Activity of Some Molluscicides Against Biomphalaria alexandrina and Lymnaea natalensis Snails. J. Egypt. Soc. Parasitol.36(3): 959-977.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	2003. Kader, A.A., B.B. Mostafa, F.M.A. Ragab, K.M. El-Said, A.A. Tantawy, and H.M.M. El-Khayat. Influence of Some Natural and Synthetic Substances on Certain Fresh Water Organisms and the Snail Vectors of Schistosomiasis and Fascioliasis. Egypt.J.Schistosomiasis Infect.Endem.Dis., Natl.Inf.and Doc.Ctr.(NIDOC), Cairo, Egypt25: 53-65.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	2008. Hassan, A.A., N.M. Shoukary, and N.M.M. Ismail. Efficacy of Temperature, and Two Commonly Used Molluscicides and Fertilizers on Fasciola gigantica Eggs. J. Egypt. Soc. Parasitol.38(2): 621-634.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	820	NA	NR	ug/L	LAB	1977. Sullivan, J.T., J.R. Palmieri, and R. Agoes. Survival of Lymnaea rubiginosa Infected with Echinostoma audyi and Exposed to Copper Sulphate. Trans. R. Soc. Trop. Med. Hyg.71(1): 84-85.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	141.73	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	169.78	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	182	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	19.47	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	19.51	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	26.08	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	29.08	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	29.36	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	30.68	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	34.22	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	36.23	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	39.64	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	42.77	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	44.88	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	62.04	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	D	78.83	NR	NR	ug/L	LAB	2008. Rogevich, E.C., T.C. Hoang, and G.M. Rand. The Effects of Water Quality and Age on the Acute Toxicity of Copper to the Florida Apple Snail, Pomacea paludosa. Arch. Environ. Contam. Toxicol.54(4): 690-696.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	165	NR	NR	ug/L	LAB	2003. Kader, A.A., B.B. Mostafa, F.M.A. Ragab, K.M. El-Said, A.A. Tantawy, and H.M.M. El-Khayat. Influence of Some Natural and Synthetic Substances on Certain Fresh Water Organisms and the Snail Vectors of Schistosomiasis and Fascioliasis. Egypt.J.Schistosomiasis Infect.Endem.Dis., Natl.Inf.and Doc.Ctr.(NIDOC), Cairo, Egypt25: 53-65.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	600	NR	NR	ug/L	LAB	2006. Ragab, F.M.A., and N.M. Shoukry. Influence of Certain Fertilizers on the Activity of Some Molluscicides Against Biomphalaria alexandrina and Lymnaea natalensis Snails. J. Egypt. Soc. Parasitol.36(3): 959-977.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	170	NR	NR	ug/L	LAB	2008. Hassan, A.A., N.M. Shoukary, and N.M.M. Ismail. Efficacy of Temperature, and Two Commonly Used Molluscicides and Fertilizers on Fasciola gigantica Eggs. J. Egypt. Soc. Parasitol.38(2): 621-634.
Copper	Pond Snail	Molluscs	Fresh	Mortality	LOEC	Not Reported	T	136	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Mortality	LOEC	Not Reported	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Copper	Pond Snail	Molluscs	Fresh	Mortality	LOEC	Not Reported	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LOEC	Not Reported	D	16.71	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	175	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	122	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	132	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	56	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	62	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	D	8.84	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	796*	NA	NR	ug/L	LAB	1979. Chowdary, V.D., P.V. Rao, and R. Narayanan. Effect of Copper Sulfate and Sodium Pentachlorophenate on Adenine and Andenosine Phosphates in Lymnaea luteola (Mollusca: Gastropoda). Bull. Environ. Contam. Toxicol.23(4-5): 615-619.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	1300*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	10.6	NR	NR	ug/L	LAB	1993. Call, D.J.. Validation Study of a Protocol for Testing the Acute Toxicity of Pesticides to Invertebrates Using the Apple Snail (Pomacea paludosa). Coop.Agreement No.CR 819612-01, U.S.EPA, Univ.of Wisconsin-Superior, Superior, WI: 57 p..
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	2000	NR	NR	ug/L	LAB	1982. Babu, G.R., and P.V. Rao. Heavy Metal Ion Toxicity in the Freshwater Gastropod Snail Host, Lymnaea luteola. Indian J. Physiol. Pharmacol.26: 141-146.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5000*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1975. Shukla, S.S., and R.M. Roy. Studies on the Comparative Molluscicide Effects of N-Tritylmorpholine and Copper Sulphate on the Common Aquatic Snails in Andhra Pradesh (India). Trop. Anim. Health Prod.7(1): 45-50.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	2500	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	22.6	NR	NR	ug/L	LAB	1993. Call, D.J.. Validation Study of a Protocol for Testing the Acute Toxicity of Pesticides to Invertebrates Using the Apple Snail (Pomacea paludosa). Coop.Agreement No.CR 819612-01, U.S.EPA, Univ.of Wisconsin-Superior, Superior, WI: 57 p..
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5.2	NR	NR	ug/L	LAB	1993. Call, D.J.. Validation Study of a Protocol for Testing the Acute Toxicity of Pesticides to Invertebrates Using the Apple Snail (Pomacea paludosa). Coop.Agreement No.CR 819612-01, U.S.EPA, Univ.of Wisconsin-Superior, Superior, WI: 57 p..
Copper	Pond Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	122	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	132	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	56	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	62	NR	NR	ug/L	LAB	2009. Hoang, T.C., and G.M. Rand. Exposure Routes of Copper: Short Term Effects on Survival, Weight, and Uptake in Florida Apple Snails (Pomacea paludosa). Chemosphere76(3): 407-414.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Copper	Pond Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	D	NR	NR	NR	ug/L	LAB	2008. Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes, and T.A. Bargar. Copper Desorption in Flooded Agricultural Soils and Toxicity to the Florida Apple Snail (Pomacea paludosa): Implications in Everglades Restoration. Environ. Pollut.154(2): 338-347.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Reproduction	LOEC	Not Reported	D	8.84	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Reproduction	NOEC	Not Reported	D	16.71	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail	Molluscs	Fresh	Reproduction	NOEC	Not Reported	D	16.71	NR	NR	ug/L	LAB	2009. Rogevich, E.C., T.C. Hoang, and G.M. Rand. Effects of Sublethal Chronic Copper Exposure on the Growth and Reproductive Success of the Florida Apple Snail (Pomacea paludosa). Arch. Environ. Contam. Toxicol.56(3): 450-458.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	143	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	143	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	143	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	34	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	46	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	13	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	34	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	53	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	69	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	13	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	34	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	53	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	69	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	13	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	16	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	34	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	53	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid copper(2+) salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	69	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Copper	Pondmussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Pondmussel	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	60	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Copper chloride (CuCl2)	Potworm	Worms	Fresh	Mortality	NR-LETH	Not Reported	D	15000	NR	NR	ug/L	LAB	2003. Lock, K., and C.R. Janssen. Influence of Aging on Copper Bioavailability in Soils. Environ. Toxicol. Chem.22(5): 1162-1166.
Copper	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	65	NR	NR	ug/L	LAB	1997. Krishnamoorthy, P., and P. Subramanian. Copper Induced Protein Profile Variation in a Freshwater Prawn, Macrobranchium lamarrei lamarrei (H. Milne Edwards). J. Environ. Biol.18(4): 371-377.
Sulfuric acid copper(2+) salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1750	NA	NR	ug/L	LAB	1986. Patil, H.S., and M.B. Kaliwal. Relative Sensitivity of a Freshwater Prawn Macrobrachium hendersodyanum to Heavy Metals. Environ. Ecol.4(2): 286-288.
Sulfuric acid copper(2+) salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	101*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Toxicity of Copper Sulphate and Zinc Sulphate to Macrobrachium lamarrei (H. Milne Edwards) (Decapoda, Palaemonidae). Crustaceana (Leiden)47(2): 168-173.
Sulfuric acid copper(2+) salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	380	NR	NR	ug/L	LAB	2006. Lodhi, H.S., M.A. Khan, R.S. Verma, and U.D. Sharma. Acute Toxicity of Copper Sulphate to Fresh Water Prawns. J. Environ. Biol.27(3): 585-588.
Sulfuric acid copper(2+) salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	86*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Toxicity of Copper Sulphate and Zinc Sulphate to Macrobrachium lamarrei (H. Milne Edwards) (Decapoda, Palaemonidae). Crustaceana (Leiden)47(2): 168-173.
Sulfuric acid copper(2+) salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	361	NR	NR	ug/L	LAB	2006. Lodhi, H.S., M.A. Khan, R.S. Verma, and U.D. Sharma. Acute Toxicity of Copper Sulphate to Fresh Water Prawns. J. Environ. Biol.27(3): 585-588.
Sulfuric acid copper(2+) salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	73*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Toxicity of Copper Sulphate and Zinc Sulphate to Macrobrachium lamarrei (H. Milne Edwards) (Decapoda, Palaemonidae). Crustaceana (Leiden)47(2): 168-173.
Sulfuric acid copper(2+) salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	343	NR	NR	ug/L	LAB	2006. Lodhi, H.S., M.A. Khan, R.S. Verma, and U.D. Sharma. Acute Toxicity of Copper Sulphate to Fresh Water Prawns. J. Environ. Biol.27(3): 585-588.
Sulfuric acid copper(2+) salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	63*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Toxicity of Copper Sulphate and Zinc Sulphate to Macrobrachium lamarrei (H. Milne Edwards) (Decapoda, Palaemonidae). Crustaceana (Leiden)47(2): 168-173.
Sulfuric acid copper(2+) salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	304	NR	NR	ug/L	LAB	2006. Lodhi, H.S., M.A. Khan, R.S. Verma, and U.D. Sharma. Acute Toxicity of Copper Sulphate to Fresh Water Prawns. J. Environ. Biol.27(3): 585-588.
Copper chloride (CuCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1820	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Copper chloride (CuCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	21	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Copper chloride (CuCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	10	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Copper chloride (CuCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	64	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Copper chloride (CuCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	11	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Copper chloride (CuCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	10	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Copper chloride (CuCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Sulfuric acid copper(2+) salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	4800	NR	NR	ug/L	LAB	1994. Gracia, M.P., H. Salvado, M. Rius, and J.M. Amigo. Effects of Copper on Ciliate Communities from Activated Sludge Plants. Acta Protozool.33(4): 219-226.
Sulfuric acid copper(2+) salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid copper(2+) salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid copper(2+) salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	4.4	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid copper(2+) salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5.49	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	6.4	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Sulfuric acid copper(2+) salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	6.4	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Sulfuric acid copper(2+) salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid copper(2+) salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Sulfuric acid copper(2+) salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	500	NR	NR	ug/L	LAB	1997. Abraham, J.V., R.D. Butler, and D.C. Sigee. Quantified Elemental Changes in Aspidisca cicada and Vorticella convallaria After Exposure to Aluminium, Copper, and Zinc. Protoplasma198(3-4): 143-154.
Copper chloride (CuCl2)	Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1.45	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Copper chloride (CuCl2)	Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1.75	NR	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Sulfuric acid copper(2+) salt (1:1)	Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1994. Gracia, M.P., H. Salvado, M. Rius, and J.M. Amigo. Effects of Copper on Ciliate Communities from Activated Sludge Plants. Acta Protozool.33(4): 219-226.
Sulfuric acid copper(2+) salt (1:1)	Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1994. Gracia, M.P., H. Salvado, M. Rius, and J.M. Amigo. Effects of Copper on Ciliate Communities from Activated Sludge Plants. Acta Protozool.33(4): 219-226.
Copper chloride (CuCl2)	Protozoan Phylum	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Sulfuric acid copper(2+) salt (1:1)	Ragworm	Worms	Fresh	Growth	IC50	Not Reported	T	25	NR	NR	ug/L	LAB	2005. Moreira, S.M., M. Moreira-Santos, L. Guilhermino, and R. Ribeiro. A Short-Term Sublethal In Situ Toxicity Assay with Hediste diversicolor (Polychaeta) for Estuarine Sediments Based on Postexposure Feeding. Environ. Toxicol. Chem.24(8): 2010-2018.
Copper	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Copper	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Copper	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Copper	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Sulfuric acid copper(2+) salt (1:1)	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	T	241	NR	NR	ug/L	LAB	2005. Moreira, S.M., M. Moreira-Santos, L. Guilhermino, and R. Ribeiro. A Short-Term Sublethal In Situ Toxicity Assay with Hediste diversicolor (Polychaeta) for Estuarine Sediments Based on Postexposure Feeding. Environ. Toxicol. Chem.24(8): 2010-2018.
Sulfuric acid copper(2+) salt (1:1)	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	T	125	NR	NR	ug/L	LAB	2005. Moreira, S.M., M. Moreira-Santos, L. Guilhermino, and R. Ribeiro. A Short-Term Sublethal In Situ Toxicity Assay with Hediste diversicolor (Polychaeta) for Estuarine Sediments Based on Postexposure Feeding. Environ. Toxicol. Chem.24(8): 2010-2018.
Copper	Ragworm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	D	10	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Growth	IC10	Shell	D	5.7	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Growth	IC25	Shell	D	7.5	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Growth	LOEC	Shell	D	6.4	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Growth	MATC	Shell	D	5.1	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Growth	NOEC	Shell	D	4.1	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Copper	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	37	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	12	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	12	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	13	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	26	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	37	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	45	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	22	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	13	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	17	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	33	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	37	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	12	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	13	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	8.6	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	20	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	37	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	45	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	22	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	D	27	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	17	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	24	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	EC50	Not Reported	T	33	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	IC10	Not Reported	D	4.9	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	IC25	Not Reported	D	6.3	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	83	NA	NR	ug/L	LAB	1993. Jacobson, P.J., J.L. Farris, D.S. Cherry, and R.J. Neves. Juvenile Freshwater Mussel (Bivalvia: Unionidae) Responses to Acute Toxicity Testing with Copper. Environ. Toxicol. Chem.12: 879-883.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	36	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	37	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	38	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	39	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	46	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	46	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	46	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	46	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	46	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	55	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	65	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	71	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	73	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	75	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	46	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	66	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	83	NA	NR	ug/L	LAB	1993. Jacobson, P.J., J.L. Farris, D.S. Cherry, and R.J. Neves. Juvenile Freshwater Mussel (Bivalvia: Unionidae) Responses to Acute Toxicity Testing with Copper. Environ. Toxicol. Chem.12: 879-883.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	LOEC	Not Reported	D	15	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	MATC	Not Reported	D	9.8	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	NOEC	Not Reported	D	6.4	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	25	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	D	51	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, I.E. Greer, D.K. Hardesty, C.D. Ivey, J.L. Kunz, W.G. Brumbaugh, F.J. Dwyer, A.D. Roberts, T.. Chronic Toxicity of Copper and Ammonia to Juvenile Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2048-2056.
Sulfuric acid copper(2+) salt (1:1)	Rainbow	Molluscs	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDA	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Ramshorn Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	460	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	Ramshorn Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	36360*	NA	NR	ug/L	LAB	1979. Furmanska, M.. Studies of the Effect of Copper, Zinc, and Iron on the Biotic Components of Aquatic Ecosystems. Pol. Arch. Hydrobiol.26(1-2): 213-220.
Sulfuric acid copper(2+) salt (1:1)	Ramshorn Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	720	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	Rayed Bean	Molluscs	Fresh	Mortality	EC50	Not Reported	D	6.9	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rayed Bean	Molluscs	Fresh	Mortality	EC50	Not Reported	D	4.6	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4170	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1990	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2330	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	242	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1780	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	199	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3350	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1520	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	146	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1350	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1380	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1190	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8100	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1150	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1090	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1140	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	716	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	556	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	720	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	890	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	206	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	527	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	776	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	184	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	657	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3024	NA	NR	ug/L	LAB	1983. Rice, D.W.,Jr., and F.L. Harrison. The Sensitivity of Adult, Embryonic, and Larval Crayfish Procambarus clarkii to Copper. NUREG/CR-3133, UCRL-53048, U.S.Nucl.Regul.Commiss., Washington, DC: 17 p..
Copper hydroxide (Cu(OH)2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2918000	NA	NR	ug/L	LAB	1980. Cheah, M.L., J.W.,Jr. Avault, and J.B. Graves. Acute Toxicity of Selected Rice Pesticides to Crayfish Procambarus clarkii. Prog. Fish-Cult.42(3): 169-172.
Sulfuric acid copper(2+) salt (1:1)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	162000	NR	NR	ug/L	LAB	2006. Bini, G., and G. Chelazzi. Acclimatable Cardiac and Ventilatory Responses to Copper in the Freshwater Crayfish Procambarus clarkii. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.144(3): 235-241.
Sulfuric acid copper(2+) salt (1:1)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Naqvi, S.M., I. Devalraju, and N.H. Naqvi. Copper Bioaccumulation and Depuration by Red Swamp Crayfish, Procambarus clarkii. Bull. Environ. Contam. Toxicol.61(1): 65-71.
Sulfuric acid copper(2+) salt (1:1)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	210	NA	NR	ug/L	LAB	1986. Andreu-Moliner, E.S., M.M. Almar, I. Legarra, and A. Nunez. Toxicity of Some Ricefield Pesticides to the Crayfish p. clarkii, Under Laboratory and Field Conditions in Lake Albufera (Spain). J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes21(6): 529-537.
Sulfuric acid copper(2+) salt (1:1)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	210*	NA	NR	ug/L	LAB	1986. Andreu-Moliner, E.S., M.M. Almar, I. Legarra, and A. Nunez. Toxicity of Some Ricefield Pesticides to the Crayfish p. clarkii, Under Laboratory and Field Conditions in Lake Albufera (Spain). J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes21(6): 529-537.
Sulfuric acid copper(2+) salt (1:1)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	10000	NR	NR	ug/L	LAB	2006. Bini, G., and G. Chelazzi. Acclimatable Cardiac and Ventilatory Responses to Copper in the Freshwater Crayfish Procambarus clarkii. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.144(3): 235-241.
Copper chloride (CuCl2)	River Snail	Molluscs	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	1995. Svendsen, C., and J.M. Weeks. The Use of a Lysosome Assay for the Rapid Assessment of Cellular Stress from Copper to the Freshwater Snail Viviparus contectus (Millet). Mar. Pollut. Bull.31(1-3): 139-142.
Sulfuric acid copper(2+) salt (1:1)	Riverine Grass Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1340		NC	ug/L	LAB	2002. Kamthe, P.N.. Acute Toxicity of the Agricultural Chemicals Endosulfan and Copper Sulfate to a Freshwater Shrimp, Palaemonetes paludosus. M.S.Thesis, Florida Atlantic Univ., Boca Raton, FL: 28 p..
Sulfuric acid copper(2+) salt (1:1)	Riverine Grass Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	900		NC	ug/L	LAB	2002. Kamthe, P.N.. Acute Toxicity of the Agricultural Chemicals Endosulfan and Copper Sulfate to a Freshwater Shrimp, Palaemonetes paludosus. M.S.Thesis, Florida Atlantic Univ., Boca Raton, FL: 28 p..
Sulfuric acid copper(2+) salt (1:1)	Riverine Grass Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	820		NC	ug/L	LAB	2002. Kamthe, P.N.. Acute Toxicity of the Agricultural Chemicals Endosulfan and Copper Sulfate to a Freshwater Shrimp, Palaemonetes paludosus. M.S.Thesis, Florida Atlantic Univ., Boca Raton, FL: 28 p..
Sulfuric acid copper(2+) salt (1:1)	Riverine Grass Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	790		NC	ug/L	LAB	2002. Kamthe, P.N.. Acute Toxicity of the Agricultural Chemicals Endosulfan and Copper Sulfate to a Freshwater Shrimp, Palaemonetes paludosus. M.S.Thesis, Florida Atlantic Univ., Boca Raton, FL: 28 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Riverine Grass Shrimp	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1500		NC	ug/L	LAB	2002. Kamthe, P.N.. Acute Toxicity of the Agricultural Chemicals Endosulfan and Copper Sulfate to a Freshwater Shrimp, Palaemonetes paludosus. M.S.Thesis, Florida Atlantic Univ., Boca Raton, FL: 28 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Growth	LOEC	Whole Organism	T	37.5	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Growth	LOEC	Whole Organism	T	37.5	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Growth	NOEC	Whole Organism	T	150	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Growth	NOEC	Whole Organism	T	150	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	ug/L	LAB	2008. Sarma, S.S.S., P. Brena-Bustamante, and S. Nandini. Body Size and Population Growth of Brachionus patulus (Rotifera) in Relation to Heavy Metal (Copper and Mercury) Concentrations. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control43(5): 547-553.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	EC10	Not Reported	T	33		NR	ug/L	LAB	2000. Radix, P., M. Leonard, C. Papantoniou, G. Roman, E. Saouter, S. Gallotti-Schmitt, H. Thiebaud, and P. Vasseur. Comparison of Four Chronic Toxicity Tests Using Algae, Bacteria, and Invertebrates Assessed with Sixteen Chemicals. Ecotoxicol. Environ. Saf.47(2): 186-194.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	58		NR	ug/L	LAB	2000. Radix, P., M. Leonard, C. Papantoniou, G. Roman, E. Saouter, S. Gallotti-Schmitt, H. Thiebaud, and P. Vasseur. Comparison of Four Chronic Toxicity Tests Using Algae, Bacteria, and Invertebrates Assessed with Sixteen Chemicals. Ecotoxicol. Environ. Saf.47(2): 186-194.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	9.2	NA	NR	ug/L	LAB	1993. Janssen, C.R., M.D. Ferrando Rodrigo, and G. Persoone. Ecotoxicological Studies with the Freshwater Rotifer Brachionus calyciflorus I. Conceptual Framework and Rotifer. Hydrobiologia255-256: 21-32.
Copper	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	18	NR	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Copper	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	25	NR	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Copper	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Copper	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26	NR	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Copper	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	31	NR	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Copper	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1991. Snell, T.W., B.D. Moffat, C. Janssen, and G. Persoone. Acute Toxicity Tests Using Rotifers IV. Effects of Cyst Age, Temperature, and Salinity on the Sensitivity of Brachionus calyciflorus. Ecotoxicol. Environ. Saf.21(3): 308-317.
Copper	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1991. Snell, T.W., B.D. Moffat, C. Janssen, and G. Persoone. Acute Toxicity Tests Using Rotifers IV. Effects of Cyst Age, Temperature, and Salinity on the Sensitivity of Brachionus calyciflorus. Ecotoxicol. Environ. Saf.21(3): 308-317.
Copper	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Copper	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	230		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Copper	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	60		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Copper	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	330		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Copper	Rotifer	Invertebrates	NR	Mortality	LC50	Not Reported	T	63	NA	NR	ug/L	LAB	1995. Moffat, B.D., and T.W. Snell. Rapid Toxicity Assessment Using an In Vivo Enzyme Test for Brachionus plicatilis (Rotifera). Ecotoxicol. Environ. Saf.30: 47-53.
Copper chloride (CuCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sarma, S.S.S., T. Ramirez Perez, and S. Nandini. Comparison of the Sensitivitiy of Branchionus calyciflorus and Branchionus patulus (Rotifera) to Selected Heavy Metals Under Low and high Food (Chlorella vulgaris) Levels. Bull. Environ. Contam. Toxicol.64(5): 735-739.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sarma, S.S.S., T. Ramirez Perez, and S. Nandini. Comparison of the Sensitivitiy of Branchionus calyciflorus and Branchionus patulus (Rotifera) to Selected Heavy Metals Under Low and high Food (Chlorella vulgaris) Levels. Bull. Environ. Contam. Toxicol.64(5): 735-739.
Copper chloride (CuCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sarma, S.S.S., T. Ramirez Perez, and S. Nandini. Comparison of the Sensitivitiy of Branchionus calyciflorus and Branchionus patulus (Rotifera) to Selected Heavy Metals Under Low and high Food (Chlorella vulgaris) Levels. Bull. Environ. Contam. Toxicol.64(5): 735-739.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	F	0.4	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	16.6	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1993. Persoone, G., C. Blaise, T. Snell, C. Janssen, and M. Van Steertegem. Cyst-Based Toxicity Tests: II. Report on an International Intercalibration Exercise with Three Cost-Effective Toxkits. Z. Angew. Zool.79(1): 17-36.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	33	NA	NR	ug/L	LAB	1993. Persoone, G., C. Blaise, T. Snell, C. Janssen, and M. Van Steertegem. Cyst-Based Toxicity Tests: II. Report on an International Intercalibration Exercise with Three Cost-Effective Toxkits. Z. Angew. Zool.79(1): 17-36.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	33	NA	NR	ug/L	LAB	1993. Persoone, G., C. Blaise, T. Snell, C. Janssen, and M. Van Steertegem. Cyst-Based Toxicity Tests: II. Report on an International Intercalibration Exercise with Three Cost-Effective Toxkits. Z. Angew. Zool.79(1): 17-36.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	38	NA	NR	ug/L	LAB	1993. Persoone, G., C. Blaise, T. Snell, C. Janssen, and M. Van Steertegem. Cyst-Based Toxicity Tests: II. Report on an International Intercalibration Exercise with Three Cost-Effective Toxkits. Z. Angew. Zool.79(1): 17-36.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	9.4	NA	NR	ug/L	LAB	1993. Porta, A.A., and A.E. Ronco. Cu(II) Acute Toxicity to the Rotifer Brachionus calyciflorus, as Affected by Fulvic Acids of Freshwater Origin. Environ. Pollut.82(3): 263-267.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1989. Couillard, Y., P. Ross, and B. Pinel-Alloul. Acute Toxicity of Six Metals to the Rotifer Brachionus calyciflorus, with Comparisons to Other Freshwater Organisms. Toxic. Assess.4(4): 451-462.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1992. Ferrando, M.D., E. Andreu-Moliner, and A. Fernandez-Casalderrey. Relative Sensitivity of Daphnia magna and Brachionus calyciflorus to Five Pesticides. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes27(5): 511-522.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	76	NA	NR	ug/L	LAB	1992. Ferrando, M.D., E. Andreu-Moliner, and A. Fernandez-Casalderrey. Relative Sensitivity of Daphnia magna and Brachionus calyciflorus to Five Pesticides. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes27(5): 511-522.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1989. Snell, T.W., and G. Persoone. Acute Toxicity Bioassays Using Rotifers. II. A Freshwater Test with Brachionus rubens. Aquat. Toxicol.14(1): 81-92.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1150	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1210	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1430	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1130	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	950	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LOEC	Not Reported	T	2.5	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1993. Janssen, C.R., M.D. Ferrando Rodrigo, and G. Persoone. Ecotoxicological Studies with the Freshwater Rotifer Brachionus calyciflorus I. Conceptual Framework and Rotifer. Hydrobiologia255-256: 21-32.
Copper	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	150		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Copper	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	20		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Copper	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	50		NC	ug/L	LAB	2001. Perez-Legaspi, I.A., and R. Rico-Martinez. Acute Toxicity Tests on Three Species of the Genus Lecane (Rotifera: Monogononta). Hydrobiologia446-447: 375-381.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	33		NR	ug/L	LAB	2000. Radix, P., M. Leonard, C. Papantoniou, G. Roman, E. Saouter, S. Gallotti-Schmitt, H. Thiebaud, and P. Vasseur. Comparison of Four Chronic Toxicity Tests Using Algae, Bacteria, and Invertebrates Assessed with Sixteen Chemicals. Ecotoxicol. Environ. Saf.47(2): 186-194.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	1.2	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	9.4	NA	NR	ug/L	LAB	1989. Snell, T.W., and G. Persoone. Acute Toxicity Bioassays Using Rotifers. II. A Freshwater Test with Brachionus rubens. Aquat. Toxicol.14(1): 81-92.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NOEC	Not Reported	T	9.4	NA	NR	ug/L	LAB	1989. Snell, T.W., and G. Persoone. Acute Toxicity Bioassays Using Rotifers. II. A Freshwater Test with Brachionus rubens. Aquat. Toxicol.14(1): 81-92.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Ferrando, M.D., C. Janssen, E. Andreu, and G. Persoone. Ecotoxicological Studies with the Freshwater Rotifer Brachionus calyciflorus. Resource Competition Between Rotifers and Daphnids Under Toxic Stress. Sci. Total Environ.Suppl: 1059-1069.
Copper	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Ferrando, M.D., C. Janssen, E. Andreu, and G. Persoone. Ecotoxicological Studies with the Freshwater Rotifer Brachionus calyciflorus. Resource Competition Between Rotifers and Daphnids Under Toxic Stress. Sci. Total Environ.Suppl: 1059-1069.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	60	NA	NR	ug/L	LAB	1989. Enesco, H.E., A. Wolanskyj, and M. Sawada. Effect of Copper on Lifespan and Lipid Peroxidation in Rotifers. Age (Omaha)12(1): 19-23.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	30	NA	NR	ug/L	LAB	1989. Enesco, H.E., A. Wolanskyj, and M. Sawada. Effect of Copper on Lifespan and Lipid Peroxidation in Rotifers. Age (Omaha)12(1): 19-23.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Charoy, C., and C.R. Janssen. The Swimming Behaviour of Brachionus calyciflorus (Rotifer) Under Toxic Stress. II. Comparative Sensitivity of Various Behavioural Criteria. Chemosphere38(14): 3247-3260.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Janssen, C.R., M.D. Ferrando Rodrigo, and G. Persoone. Ecotoxicological Studies with the Freshwater Rotifer Brachionus calyciflorus I. Conceptual Framework and Rotifer. Hydrobiologia255-256: 21-32.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	EC10	Not Reported	T	33	NR	NR	ug/L	LAB	1999. Radix, P., M. Leonard, C. Papantoniou, G. Roman, E. Saouter, S. Gallotti-Schmitt, H. Thiebaud, and P. Vasseur. Comparison of Brachionus calyciflorus 2-D and Microtox Chronic 22-H Tests with Daphnia magna 21-D Test for the Chronic Toxicity Assessment of Chemicals. Environ. Toxicol. Chem.18(10): 2178-2185.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	EC20	Not Reported	T	40	NR	NR	ug/L	LAB	1999. Radix, P., M. Leonard, C. Papantoniou, G. Roman, E. Saouter, S. Gallotti-Schmitt, H. Thiebaud, and P. Vasseur. Comparison of Brachionus calyciflorus 2-D and Microtox Chronic 22-H Tests with Daphnia magna 21-D Test for the Chronic Toxicity Assessment of Chemicals. Environ. Toxicol. Chem.18(10): 2178-2185.
Copper	Rotifer	Invertebrates	Fresh	Reproduction	EC50	Not Reported	T	26	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	EC50	Not Reported	T	26		NC	ug/L	LAB	2001. Preston, B.L., and T.W. Snell. Full Life-Cycle Toxicity Assessment Using Rotifer Resting Egg Production: Implications for Ecological Risk Assessment. Environ. Pollut.114(3): 399-406.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	EC50	Not Reported	T	6.9	NA	NR	ug/L	LAB	1993. Janssen, C.R., M.D. Ferrando Rodrigo, and G. Persoone. Ecotoxicological Studies with the Freshwater Rotifer Brachionus calyciflorus I. Conceptual Framework and Rotifer. Hydrobiologia255-256: 21-32.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	EC50	Not Reported	T	7.4	NA	NR	ug/L	LAB	1993. Janssen, C.R., M.D. Ferrando Rodrigo, and G. Persoone. Ecotoxicological Studies with the Freshwater Rotifer Brachionus calyciflorus I. Conceptual Framework and Rotifer. Hydrobiologia255-256: 21-32.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	EC50	Not Reported	T	58	NR	NR	ug/L	LAB	1999. Radix, P., M. Leonard, C. Papantoniou, G. Roman, E. Saouter, S. Gallotti-Schmitt, H. Thiebaud, and P. Vasseur. Comparison of Brachionus calyciflorus 2-D and Microtox Chronic 22-H Tests with Daphnia magna 21-D Test for the Chronic Toxicity Assessment of Chemicals. Environ. Toxicol. Chem.18(10): 2178-2185.
Copper	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	30	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	6		NC	ug/L	LAB	2001. Preston, B.L., and T.W. Snell. Full Life-Cycle Toxicity Assessment Using Rotifer Resting Egg Production: Implications for Ecological Risk Assessment. Environ. Pollut.114(3): 399-406.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	2.5	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	2.5	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Copper	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	20	NA	NR	ug/L	LAB	1992. Snell, T.W., and B.D. Moffat. A 2-d Life Cycle Test with the Rotifer Brachionus calyciflorus. Environ. Toxicol. Chem.11(9): 1249-1257.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	20		NC	ug/L	LAB	2001. Preston, B.L., and T.W. Snell. Full Life-Cycle Toxicity Assessment Using Rotifer Resting Egg Production: Implications for Ecological Risk Assessment. Environ. Pollut.114(3): 399-406.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	2.8		NC	ug/L	LAB	2001. Preston, B.L., and T.W. Snell. Full Life-Cycle Toxicity Assessment Using Rotifer Resting Egg Production: Implications for Ecological Risk Assessment. Environ. Pollut.114(3): 399-406.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	1.2	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	1.2	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NOEC	Not Reported	T	33	NR	NR	ug/L	LAB	1999. Radix, P., M. Leonard, C. Papantoniou, G. Roman, E. Saouter, S. Gallotti-Schmitt, H. Thiebaud, and P. Vasseur. Comparison of Brachionus calyciflorus 2-D and Microtox Chronic 22-H Tests with Daphnia magna 21-D Test for the Chronic Toxicity Assessment of Chemicals. Environ. Toxicol. Chem.18(10): 2178-2185.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Janssen, C.R., G. Persoone, and T.W. Snell. Cyst-Based Toxicity Tests. VIII. Short-Chronic Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus. Aquat. Toxicol.28(3/4): 243-258.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	1.2	NA	NR	ug/L	LAB	1994. Janssen, C.R., G. Persoone, and T.W. Snell. Cyst-Based Toxicity Tests. VIII. Short-Chronic Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus. Aquat. Toxicol.28(3/4): 243-258.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	2.5	NA	NR	ug/L	LAB	1994. Janssen, C.R., G. Persoone, and T.W. Snell. Cyst-Based Toxicity Tests. VIII. Short-Chronic Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus. Aquat. Toxicol.28(3/4): 243-258.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1992. Janssen, C.. The Use of Sublethal Criteria for Toxicity Tests with the Freshwater Rotifer Brachionus calyciflorus (Pallas). Ph.D.Thesis, University of Gent, Belgium: 157 p..
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.
Sulfuric acid copper(2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Effect of Pulsed Exposure to Heavy Metals (Copper and Cadmium) on Some Population Variables of Brachionus calyciflorus Pallas (Rotifera: Brachionidae: Monogononta). Hydrobiologia593(1): 201-208.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Rotifer Phylum	Invertebrates	Fresh	Mortality	LC50*	Not Reported	T	1.59	NA	NR	umol/L	LAB	1984. Borgmann, U., and K.M. Ralph. Copper Complexation and Toxicity to Freshwater Zooplankton. Arch. Environ. Contam. Toxicol.13(4): 403-409.
Sulfuric acid copper(2+) salt (1:1)	Round Hickorynut	Molluscs	Fresh	Mortality	EC50	Not Reported	D	13	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Round Hickorynut	Molluscs	Fresh	Mortality	EC50	Not Reported	D	11.3	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Copper	Scaleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	21	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Scaleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	19	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Scaleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	14	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Scaleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	14	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Scaleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	29	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Scaleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	22	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Sulfuric acid copper(2+) salt (1:1)	Scaleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	21	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Scaleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	14	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Scaleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	29	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Scaleshell	Molluscs	Fresh	Mortality	EC50	Not Reported	T	22	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Growth	EC25	Not Reported	D	0.59	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Growth	ER25	Not Reported	T	1.05	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Growth	IC25	Not Reported	T	12		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	1880		NR	ug/L	LAB	2001. Huggett, D.B., D. Schlenk, and B.R. Griffin. Toxicity of Copper in an Oxic Stream Sediment Receiving Aquaculture Effluent. Chemosphere44(3): 361-367.
Copper	Scud	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Growth	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Kubitz, J.A., E.C. Lewek, J.M. Besser, J.B. Drake III, and J.P. Giesy. Effects of Copper-Contaminated Sediments on Hyalella azteca, Daphnia magna, and Ceriodaphnia dubia: Survival, Growth, and Enzyme Inhibition. Arch. Environ. Contam. Toxicol.29(1): 97-103.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Growth	NR	Not Reported	T	260	NA	NR	ug/L	FIELDN	1996. Shaw, J.L., and J.P. Manning. Evaluating Macroinvertebrate Population and Community Level Effects in Outdoor Microcosms: Use of In Situ Bioassays and Multivariate Analysis. Environ. Toxicol. Chem.15(5): 608-617.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC10	Not Reported	T	100	NR	NR	ug/L	LAB	2008. Giusto, A., and L. Ferrari. Copper Toxicity on Juveniles of Hyalella-apseudoazteca Gonzalez and Watling, 2003. Bull. Environ. Contam. Toxicol.81(2): 169-173.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC10	Not Reported	T	690	NR	NR	ug/L	LAB	2008. Giusto, A., and L. Ferrari. Copper Toxicity on Juveniles of Hyalella-apseudoazteca Gonzalez and Watling, 2003. Bull. Environ. Contam. Toxicol.81(2): 169-173.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC10	Not Reported	T	580	NR	NR	ug/L	LAB	2008. Giusto, A., and L. Ferrari. Copper Toxicity on Juveniles of Hyalella-apseudoazteca Gonzalez and Watling, 2003. Bull. Environ. Contam. Toxicol.81(2): 169-173.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC25	Not Reported	T	12		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC25	Not Reported	T	21		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC25	Not Reported	D	1.36	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	212	NA	NR	ug/L	LAB	1988. De March, B.G.E.. Acute Toxicity of Binary Mixtures of Five Cations (Cu2+, Cd2+, Zn2+, Mg2+, and K+) to the Freshwater Amphipod Gammarus lacustris (Sars): Alternative Descriptive Models. Can. J. Fish. Aquat. Sci.45(4): 625-633.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NA	NR	ug/L	LAB	1991. Taylor, E.J., S.J. Maund, and D. Pascoe. Toxicity of Four Common Pollutants to the Freshwater Macroinvertebrates Chironomus riparius Meigen (Insecta: Diptera) and Gammarus pulex (L.). Arch. Environ. Contam. Toxicol.21: 371-376.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47	NA	NR	ug/L	LAB	1991. Taylor, E.J., S.J. Maund, and D. Pascoe. Toxicity of Four Common Pollutants to the Freshwater Macroinvertebrates Chironomus riparius Meigen (Insecta: Diptera) and Gammarus pulex (L.). Arch. Environ. Contam. Toxicol.21: 371-376.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37	NA	NR	ug/L	LAB	1991. Taylor, E.J., S.J. Maund, and D. Pascoe. Toxicity of Four Common Pollutants to the Freshwater Macroinvertebrates Chironomus riparius Meigen (Insecta: Diptera) and Gammarus pulex (L.). Arch. Environ. Contam. Toxicol.21: 371-376.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1995. Phipps, G.L., V.R. Mattson, and G.T. Ankley. Relative Sensitivity of Three Freshwater Benthic Macroinvertebrates to Ten Contaminants. Arch. Environ. Contam. Toxicol.28(3): 281-286.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28	NA	NR	ug/L	LAB	1993. Ankley, G.T., V.R. Mattson, E.N. Leonard, C.W. West, and J.L. Bennett. Predicting the Acute Toxicity of Copper in Freshwater Sediments: Evaluation of the Role of Acid-Volatile Sulfide. Environ. Toxicol. Chem.12: 315-320.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	106.8	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	127.8	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	142.7	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	17.4	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	18	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	18.5	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	18.7	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	19.1	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	19.4	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	21.1	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	23.7	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	24.2	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	24.8	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	34.6	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	41.8	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	92.5	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Copper	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	283	NR	NR	ug/L	LAB	2002. Othman, M.S., and D. Pascoe. Reduced Recruitment in Hyalella azteca (Saussure, 1858) Exposed to Copper. Ecotoxicol. Environ. Saf.53(1): 59-64.
Copper chloride	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1997. Pantani, C., G. Pannunzio, M. De Cristofaro, A.A. Novelli, and M. Salvatori. Comparative Acute Toxicity of Some Pesticides, Metals, and Surfactants to Gammarus italicus Goedm. and Echinogammarus tibaldii Pink. and Stock (Crustacea: Amphipoda). Bull. Environ. Contam. Toxicol.59(6): 963-967.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	950	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	610	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	440	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	179	NA	NR	ug/L	LAB	1990. Pantani, C., P.F. Ghetti, A. Cavacini, and P. Muccioni. Acute Toxicity of Equitoxic Binary Mixtures of Some Metals, Surfactants and Pesticides to the Freshwater Amphipod Gammarus italicus Goedm.. Environ. Technol.11(12): 1143-1146.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1152	D	61	ug/L	LAB	1984. Cairns, M.A., A.V. Nebeker, J.H. Gakstatter, and W.L. Griffis. Toxicity of Copper-Spiked Sediments to Freshwater Invertebrates. Environ. Toxicol. Chem.3(3): 435-445.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	375	NA	NR	ug/L	LAB	1983. Stephenson, R.R.. Effects of Water Hardness, Water Temperature, and Size of the Test Organism on the Susceptibility of the Freshwater Shrimp, Gammarus pulex (L.), to Toxicants. Bull. Environ. Contam. Toxicol.31(4): 459-466.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	86	NA	NR	ug/L	LAB	1983. Stephenson, R.R.. Effects of Water Hardness, Water Temperature, and Size of the Test Organism on the Susceptibility of the Freshwater Shrimp, Gammarus pulex (L.), to Toxicants. Bull. Environ. Contam. Toxicol.31(4): 459-466.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	620	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	183	NA	NR	ug/L	LAB	1983. Stephenson, R.R.. Effects of Water Hardness, Water Temperature, and Size of the Test Organism on the Susceptibility of the Freshwater Shrimp, Gammarus pulex (L.), to Toxicants. Bull. Environ. Contam. Toxicol.31(4): 459-466.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	41	NA	NR	ug/L	LAB	1983. Stephenson, R.R.. Effects of Water Hardness, Water Temperature, and Size of the Test Organism on the Susceptibility of the Freshwater Shrimp, Gammarus pulex (L.), to Toxicants. Bull. Environ. Contam. Toxicol.31(4): 459-466.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	127	NA	NR	ug/L	LAB	1983. Stephenson, R.R.. Effects of Water Hardness, Water Temperature, and Size of the Test Organism on the Susceptibility of the Freshwater Shrimp, Gammarus pulex (L.), to Toxicants. Bull. Environ. Contam. Toxicol.31(4): 459-466.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	30	NA	NR	ug/L	LAB	1983. Stephenson, R.R.. Effects of Water Hardness, Water Temperature, and Size of the Test Organism on the Susceptibility of the Freshwater Shrimp, Gammarus pulex (L.), to Toxicants. Bull. Environ. Contam. Toxicol.31(4): 459-466.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	109	NA	NR	ug/L	LAB	1983. Stephenson, R.R.. Effects of Water Hardness, Water Temperature, and Size of the Test Organism on the Susceptibility of the Freshwater Shrimp, Gammarus pulex (L.), to Toxicants. Bull. Environ. Contam. Toxicol.31(4): 459-466.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	21	NA	NR	ug/L	LAB	1983. Stephenson, R.R.. Effects of Water Hardness, Water Temperature, and Size of the Test Organism on the Susceptibility of the Freshwater Shrimp, Gammarus pulex (L.), to Toxicants. Bull. Environ. Contam. Toxicol.31(4): 459-466.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.16		NC	uM	LAB	2003. Morris, J.M., S.A. Collyard, and J.S. Meyer. Effects of Chronic Copper Exposure on the Nutritional Composition of Hyalella azteca. Aquat. Toxicol.63(2): 197-206.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	719	D	39	ug/L	LAB	1984. Cairns, M.A., A.V. Nebeker, J.H. Gakstatter, and W.L. Griffis. Toxicity of Copper-Spiked Sediments to Freshwater Invertebrates. Environ. Toxicol. Chem.3(3): 435-445.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.15	NR	NR	uM	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.2	NR	NR	uM	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.21	NR	NR	uM	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.27	NR	NR	uM	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.34	NR	NR	uM	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.35	NR	NR	uM	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.37	NR	NR	uM	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.51	NR	NR	uM	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.52	NR	NR	uM	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.78	NR	NR	uM	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.83	NR	NR	uM	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Nitric acid, Copper(2+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	329	NR	NR	ug/L	LAB	1990. Bascombe, A.D., J.B. Ellis, D.M. Revitt, and R.B.E. Shutes. The Development of Ecotoxicological Criteria in Urban Catchments. Water Sci. Technol.22(10-11): 173-179.
Nitric acid, Copper(2+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Copper(2+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Copper(2+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	87	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1979. Judy, R.D.,Jr.. The Acute Toxicity of Copper to Gammarus fasciatus Say, a Freshwater Amphipod. Bull. Environ. Contam. Toxicol.21(1/2): 219-224.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1979. Judy, R.D.,Jr.. The Acute Toxicity of Copper to Gammarus fasciatus Say, a Freshwater Amphipod. Bull. Environ. Contam. Toxicol.21(1/2): 219-224.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1999. Guven, K., C. Ozbay, E. Unlu, and A. Satar. Acute Lethal Toxicity and Accumulation of Copper in Gammarus pulex (L.) (Amphipoda). Turk. J. Biol. (Turk Biol. Derg.)23(4): 513-521.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NR	NR	ug/L	LAB	1999. Guven, K., C. Ozbay, E. Unlu, and A. Satar. Acute Lethal Toxicity and Accumulation of Copper in Gammarus pulex (L.) (Amphipoda). Turk. J. Biol. (Turk Biol. Derg.)23(4): 513-521.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	1999. Guven, K., C. Ozbay, E. Unlu, and A. Satar. Acute Lethal Toxicity and Accumulation of Copper in Gammarus pulex (L.) (Amphipoda). Turk. J. Biol. (Turk Biol. Derg.)23(4): 513-521.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1999. Guven, K., C. Ozbay, E. Unlu, and A. Satar. Acute Lethal Toxicity and Accumulation of Copper in Gammarus pulex (L.) (Amphipoda). Turk. J. Biol. (Turk Biol. Derg.)23(4): 513-521.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67		NC	ug/L	LAB	2001. Huggett, D.B., D. Schlenk, and B.R. Griffin. Toxicity of Copper in an Oxic Stream Sediment Receiving Aquaculture Effluent. Chemosphere44(3): 361-367.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	83		NC	ug/L	LAB	2001. Huggett, D.B., D. Schlenk, and B.R. Griffin. Toxicity of Copper in an Oxic Stream Sediment Receiving Aquaculture Effluent. Chemosphere44(3): 361-367.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	157.8		NC	ug/L	LAB	2000. Mastin, B.J., and J.H.,Jr. Rodgers. Toxicity and Bioavailability of Copper Herbicides (Clearigate, Cutrine-Plus, and Copper Sulfate) to Freshwater Animals. Arch. Environ. Contam. Toxicol.39(4): 445-451.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1993. Ankley, G.T., V.R. Mattson, E.N. Leonard, C.W. West, and J.L. Bennett. Predicting the Acute Toxicity of Copper in Freshwater Sediments: Evaluation of the Role of Acid-Volatile Sulfide. Environ. Toxicol. Chem.12: 315-320.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35.2	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	584	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67.2	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	43000	NA	NR	ug/L	LAB	1995. Kubitz, J.A., E.C. Lewek, J.M. Besser, J.B. Drake III, and J.P. Giesy. Effects of Copper-Contaminated Sediments on Hyalella azteca, Daphnia magna, and Ceriodaphnia dubia: Survival, Growth, and Enzyme Inhibition. Arch. Environ. Contam. Toxicol.29(1): 97-103.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30.5	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	44.1	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	545	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	59	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	72.2	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	754	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	151580	NR	NR	ug/L	LAB	1998. Aquatic Toxicology Group. Brenda Mines Sulphate and Molybdenum Toxicity Testing. Proj.Rep.No.2-11-825/826, Prepared for Noranda Mining and Exploration Inc., Brenda Mines Div., B.C.: 222 p..
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23.8	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24.3	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	369320	NR	NR	ug/L	LAB	1998. Aquatic Toxicology Group. Brenda Mines Sulphate and Molybdenum Toxicity Testing. Proj.Rep.No.2-11-825/826, Prepared for Noranda Mining and Exploration Inc., Brenda Mines Div., B.C.: 222 p..
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.2	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47.2	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	65.6	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	674	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Johnson, B.M., M.M. Chao, O.R. Tedrow, A.D. McQueen, and J.H.,Jr. Rodgers. Responses of Lepomis macrochirus, Pimephales promelas, Hyalella azteca, Ceriodaphnia dubia, and Daphnia magna to Exposures of Algimycin PWF and Copper Sulfate Pentahydrate. J. Aquat. Plant Manage.46: 176-183.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	42.4	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52.6	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	638	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1993. West, C.W., V.R. Mattson, E.N. Leonard, G.L. Phipps, and G.T. Ankley. Comparison of the Relative Sensitivity of Three Benthic Invertebrates to Copper-Contaminated Sediments from the Keweenaw Waterway. Hydrobiologia262: 57-63.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	310	NR	NR	ug/L	LAB	2008. Giusto, A., and L. Ferrari. Copper Toxicity on Juveniles of Hyalella-apseudoazteca Gonzalez and Watling, 2003. Bull. Environ. Contam. Toxicol.81(2): 169-173.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210	NR	NR	ug/L	LAB	2008. Giusto, A., and L. Ferrari. Copper Toxicity on Juveniles of Hyalella-apseudoazteca Gonzalez and Watling, 2003. Bull. Environ. Contam. Toxicol.81(2): 169-173.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NR	NR	ug/L	LAB	2008. Giusto, A., and L. Ferrari. Copper Toxicity on Juveniles of Hyalella-apseudoazteca Gonzalez and Watling, 2003. Bull. Environ. Contam. Toxicol.81(2): 169-173.
Copper	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	55.13		NR	ug/L	LAB	2002. Othman, M.S., and D. Pascoe. Reduced Recruitment in Hyalella azteca (Saussure, 1858) Exposed to Copper. Ecotoxicol. Environ. Saf.53(1): 59-64.
Copper	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	1120	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Copper	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	400	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Copper	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	637	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Copper	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	800	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	802	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	1.16	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2008. Johnson, B.M., M.M. Chao, O.R. Tedrow, A.D. McQueen, and J.H.,Jr. Rodgers. Responses of Lepomis macrochirus, Pimephales promelas, Hyalella azteca, Ceriodaphnia dubia, and Daphnia magna to Exposures of Algimycin PWF and Copper Sulfate Pentahydrate. J. Aquat. Plant Manage.46: 176-183.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	1880		NR	ug/L	LAB	2001. Huggett, D.B., D. Schlenk, and B.R. Griffin. Toxicity of Copper in an Oxic Stream Sediment Receiving Aquaculture Effluent. Chemosphere44(3): 361-367.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR25	Not Reported	T	1.05	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR25	Not Reported	T	3.28	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	1.3	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	4.08	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.048	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.09	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.12	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.17	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.18	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.25	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.25	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.25	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.3	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.32	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.33	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.39	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	0.49	NR	NR	umol/g	LAB	2002. Collyard, S.A.. Bioavailability of Copper to the Amphipod Hyalella azteca. M.S.Thesis, Univ.of Wyoming, Laramie, WY: 59 p..
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	L	13	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	L	16	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	L	16	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	L	17	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	L	23	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	L	30	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	L	50	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	L	50	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	L	82	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	L	82	NA	NR	ug/L	LAB	1996. Deaver, E., and J.H.,Jr. Rodgers. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environ. Toxicol. Chem.15(11): 1925-1930.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	31.56		NR	ug/L	LAB	2002. Othman, M.S., and D. Pascoe. Reduced Recruitment in Hyalella azteca (Saussure, 1858) Exposed to Copper. Ecotoxicol. Environ. Saf.53(1): 59-64.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	0.8	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	1.1	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	200	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	620	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Copper	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	89	NR	NR	ug/L	LAB	2003. Besser, J.M., W.G. Brumbaugh, T.W. May, and C.G. Ingersoll. Effects of Organic Amendments on the Toxicity and Bioavailability of Cadmium and Copper in Spiked Formulated Sediments. Environ. Toxicol. Chem.22(4): 805-815.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	0.67	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	310		NR	ug/L	LAB	2001. Huggett, D.B., D. Schlenk, and B.R. Griffin. Toxicity of Copper in an Oxic Stream Sediment Receiving Aquaculture Effluent. Chemosphere44(3): 361-367.
Copper	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1994. Taylor, E.J., E.M. Rees, and D. Pascoe. Mortality and a Drift-Related Response of the Freshwater Amphipod Gammarus pulex (L.) Exposed to Natural Sediments, Acidification and Copper. Aquat. Toxicol.29(1-2): 83-101.
Copper	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Besser, J.M., C.G. Ingersoll, E.N. Leonard, and D.R. Mount. Effect of Zeolite on Toxicity of Ammonia in Freshwater Sediments: Implications for Toxicity Identification Evaluation Procedures. Environ. Toxicol. Chem.17(11): 2310-2317.
Copper	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	16.7	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Copper	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	25.4	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Copper	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	16.7	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Copper	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	25.4	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1000	NR	NR	ug/L	LAB	1996. Lawrence, A., and C. Poulter. The Potential Role of the Estuarine Amphipod Gammarus duebeni in Sub-Lethal Ecotoxicology Testing. Water Sci. Technol.34(7-8): 93-100.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1970. Arthur, J.W., and E.N. Leonard. Effects of Copper on Gammarus pseudolimnaeus, Physa integra, and Campeloma decisum in Soft Water. J. Fish. Res. Board Can.27(7): 1277-1283.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1970. Arthur, J.W., and E.N. Leonard. Effects of Copper on Gammarus pseudolimnaeus, Physa integra, and Campeloma decisum in Soft Water. J. Fish. Res. Board Can.27(7): 1277-1283.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	260	NA	NR	ug/L	FIELDN	1996. Shaw, J.L., and J.P. Manning. Evaluating Macroinvertebrate Population and Community Level Effects in Outdoor Microcosms: Use of In Situ Bioassays and Multivariate Analysis. Environ. Toxicol. Chem.15(5): 608-617.
Copper	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	212.5		NR	ug/L	LAB	2002. Othman, M.S., and D. Pascoe. Reduced Recruitment in Hyalella azteca (Saussure, 1858) Exposed to Copper. Ecotoxicol. Environ. Saf.53(1): 59-64.
Copper chloride (CuCl)	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	14200	NR	NR	ug/L	LAB	2009. Phillips, B.M., B.S. Anderson, J.W. Hunt, S.L. Clark, J.P. Voorhees, R.S. Tjeerdema, J. Casteline, and M. Stewart. Evaluation of Phase II Toxicity Identification Evaluation Methods for Freshwater Whole Sediment and Interstitial Water. Chemosphere74(5): 648-653.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	200	NR	NR	ug/L	LAB	1999. Guven, K., C. Ozbay, E. Unlu, and A. Satar. Acute Lethal Toxicity and Accumulation of Copper in Gammarus pulex (L.) (Amphipoda). Turk. J. Biol. (Turk Biol. Derg.)23(4): 513-521.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	340	NR	NR	ug/L	LAB	2007. Zhao, Y., and M.C. Newman. The Theory Underlying Dose-Response Models Influences Predictions for Intermittent Exposures. Environ. Toxicol. Chem.26(3): 543-547.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	360	NR	NR	ug/L	LAB	2007. Zhao, Y., and M.C. Newman. The Theory Underlying Dose-Response Models Influences Predictions for Intermittent Exposures. Environ. Toxicol. Chem.26(3): 543-547.
Copper chloride (CuCl2)	Scud	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	0.1		NC	uM	LAB	2003. Morris, J.M., S.A. Collyard, and J.S. Meyer. Effects of Chronic Copper Exposure on the Nutritional Composition of Hyalella azteca. Aquat. Toxicol.63(2): 197-206.
Copper	Scud	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	23.5	NR	NR	ug/L	LAB	1994. Pascoe, D., T.J. Kedwards, S.J. Maund, E. Muthi, and E.J. Taylor. Laboratory and Field Evaluation of a Behavioural Bioassay - the Gammarus pulex (L.) Precopula Separation (GaPPS) Test. Water Res.28(2): 369-372.
Copper	Scud	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	55.13		NR	ug/L	LAB	2002. Othman, M.S., and D. Pascoe. Reduced Recruitment in Hyalella azteca (Saussure, 1858) Exposed to Copper. Ecotoxicol. Environ. Saf.53(1): 59-64.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	120		NC	ug/L	LAB	2000. Girling, A.E., D. Pascoe, C.R. Janssen, A. Peither, A. Wenzel, H. Schafer, B. Neumeier, G.C. Mitchell, E.J. Taylor, S.J.. Development of Methods for Evaluating Toxicity to Freshwater Ecosystems. Ecotoxicol. Environ. Saf.45(2): 148-176.
Copper	Scud	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10.7	NR	NR	ug/L	LAB	1994. Pascoe, D., T.J. Kedwards, S.J. Maund, E. Muthi, and E.J. Taylor. Laboratory and Field Evaluation of a Behavioural Bioassay - the Gammarus pulex (L.) Precopula Separation (GaPPS) Test. Water Res.28(2): 369-372.
Copper	Scud	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	55.13	NR	NR	ug/L	LAB	2002. Othman, M.S., and D. Pascoe. Reduced Recruitment in Hyalella azteca (Saussure, 1858) Exposed to Copper. Ecotoxicol. Environ. Saf.53(1): 59-64.
Copper	Scud	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	31.56		NR	ug/L	LAB	2002. Othman, M.S., and D. Pascoe. Reduced Recruitment in Hyalella azteca (Saussure, 1858) Exposed to Copper. Ecotoxicol. Environ. Saf.53(1): 59-64.
Sulfuric acid copper(2+) salt (1:1)	Scud	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	30		NC	ug/L	LAB	2000. Girling, A.E., D. Pascoe, C.R. Janssen, A. Peither, A. Wenzel, H. Schafer, B. Neumeier, G.C. Mitchell, E.J. Taylor, S.J.. Development of Methods for Evaluating Toxicity to Freshwater Ecosystems. Ecotoxicol. Environ. Saf.45(2): 148-176.
Copper	Scud	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Copper chloride (CuCl2)	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	103		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	133		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	181		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	1200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Copper	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	910	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid copper(2+) salt (1:1)	Sheep Liver Fluke	Worms	Fresh	Mortality	NR	Not Reported	T	30000	NR	NR	ug/L	LAB	2008. Hassan, A.A., N.M. Shoukary, and N.M.M. Ismail. Efficacy of Temperature, and Two Commonly Used Molluscicides and Fertilizers on Fasciola gigantica Eggs. J. Egypt. Soc. Parasitol.38(2): 621-634.
Sulfuric acid copper(2+) salt (1:1)	Sheep Liver Fluke	Worms	Fresh	Mortality	NR	Not Reported	T	30000	NR	NR	ug/L	LAB	2008. Hassan, A.A., N.M. Shoukary, and N.M.M. Ismail. Efficacy of Temperature, and Two Commonly Used Molluscicides and Fertilizers on Fasciola gigantica Eggs. J. Egypt. Soc. Parasitol.38(2): 621-634.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	161	D	135	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	183	D	169	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	248	D	128	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	294	D	154	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	112	D	89	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	D	52	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	178	D	80	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	99	D	73	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	108	D	33	ug/L	LAB	1990. Daly, H.R., M.J. Jones, B.T. Hart, and I.C. Campbell. Copper Toxicity to Paratya australiensis: III. Influence of Dissolved Organic Matter. Environ. Toxicol. Chem.9(8): 1013-1018.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	141	D	21	ug/L	LAB	1990. Daly, H.R., M.J. Jones, B.T. Hart, and I.C. Campbell. Copper Toxicity to Paratya australiensis: III. Influence of Dissolved Organic Matter. Environ. Toxicol. Chem.9(8): 1013-1018.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	184	D	54	ug/L	LAB	1990. Daly, H.R., M.J. Jones, B.T. Hart, and I.C. Campbell. Copper Toxicity to Paratya australiensis: III. Influence of Dissolved Organic Matter. Environ. Toxicol. Chem.9(8): 1013-1018.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	196	D	71	ug/L	LAB	1990. Daly, H.R., M.J. Jones, B.T. Hart, and I.C. Campbell. Copper Toxicity to Paratya australiensis: III. Influence of Dissolved Organic Matter. Environ. Toxicol. Chem.9(8): 1013-1018.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	238	D	28	ug/L	LAB	1990. Daly, H.R., M.J. Jones, B.T. Hart, and I.C. Campbell. Copper Toxicity to Paratya australiensis: III. Influence of Dissolved Organic Matter. Environ. Toxicol. Chem.9(8): 1013-1018.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	317	D	74	ug/L	LAB	1990. Daly, H.R., M.J. Jones, B.T. Hart, and I.C. Campbell. Copper Toxicity to Paratya australiensis: III. Influence of Dissolved Organic Matter. Environ. Toxicol. Chem.9(8): 1013-1018.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	103	D	79	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	106	D	44	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	D	56	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.
Copper	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	85	D	59	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: II. Influence of Bicarbonate and Ionic Strength. Environ. Toxicol. Chem.9(8): 1007-1011.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	2006. Bello-Olusoji, O.A., and B.O. Adebola. Toxic-Effect of Aldrin and Copper Sulphate on Freshwater Prawn-Caridina africana. J. Fish. Int.1(1-2): 12-16.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	2006. Bello-Olusoji, O.A., and B.O. Adebola. Toxic-Effect of Aldrin and Copper Sulphate on Freshwater Prawn-Caridina africana. J. Fish. Int.1(1-2): 12-16.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	2006. Bello-Olusoji, O.A., and B.O. Adebola. Toxic-Effect of Aldrin and Copper Sulphate on Freshwater Prawn-Caridina africana. J. Fish. Int.1(1-2): 12-16.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	2006. Bello-Olusoji, O.A., and B.O. Adebola. Toxic-Effect of Aldrin and Copper Sulphate on Freshwater Prawn-Caridina africana. J. Fish. Int.1(1-2): 12-16.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	194	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	71*	NA	NR	ug/L	LAB	1979. Ghate, H.V., and L. Mulherkar. Histological Changes in the Gills of Two Freshwater Prawn Species Exposed to Copper Sulphate. Indian J. Exp. Biol.17(8): 838-840.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	98	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	74	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	56	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	43	D	22	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: I. Influence of Nitrilotriacetic Acid and Glycine. Environ. Toxicol. Chem.9(8): 997-1006.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	34	D	16	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: I. Influence of Nitrilotriacetic Acid and Glycine. Environ. Toxicol. Chem.9(8): 997-1006.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	D	11	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: I. Influence of Nitrilotriacetic Acid and Glycine. Environ. Toxicol. Chem.9(8): 997-1006.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	99	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29	D	10	ug/L	LAB	1990. Daly, H.R., I.C. Campbell, and B.T. Hart. Copper Toxicity to Paratya australiensis: I. Influence of Nitrilotriacetic Acid and Glycine. Environ. Toxicol. Chem.9(8): 997-1006.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	98	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	98	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	98	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	420	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid copper(2+) salt (1:1)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	760	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Signal Crayfish	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	18000		NC	ug/L	LAB	2006. Melendre, P.M., J.D. Celada, J.M. Carral, M. Saez-Royuela, and A. Aguilera. Effectiveness of Antifungal Treatments During Artificial Incubation of the Signal Crayfish Eggs (Pacifastacus leniusculus Dana. Astacidae). Aquaculture257(1-4): 257-265.
Sulfuric acid copper(2+) salt (1:1)	Signal Crayfish	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	18000		NC	ug/L	LAB	2006. Melendre, P.M., J.D. Celada, J.M. Carral, M. Saez-Royuela, and A. Aguilera. Effectiveness of Antifungal Treatments During Artificial Incubation of the Signal Crayfish Eggs (Pacifastacus leniusculus Dana. Astacidae). Aquaculture257(1-4): 257-265.
Copper hydroxide (Cu(OH)2)	Smooth Caridina	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7930	NR	NR	ug/L	LAB	2008. Sucahyo, D., N.M. Van Straalen, A. Krave, and C.A.M. Van Gestel. Acute Toxicity of Pesticides to the Tropical Freshwater Shrimp Caridina laevis. Ecotoxicol. Environ. Saf.69: 421-427.
Copper hydroxide (Cu(OH)2)	Smooth Caridina	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3390	NR	NR	ug/L	LAB	2008. Sucahyo, D., N.M. Van Straalen, A. Krave, and C.A.M. Van Gestel. Acute Toxicity of Pesticides to the Tropical Freshwater Shrimp Caridina laevis. Ecotoxicol. Environ. Saf.69: 421-427.
Copper hydroxide (Cu(OH)2)	Smooth Caridina	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	2000	NR	NR	ug/L	LAB	2008. Sucahyo, D., N.M. Van Straalen, A. Krave, and C.A.M. Van Gestel. Acute Toxicity of Pesticides to the Tropical Freshwater Shrimp Caridina laevis. Ecotoxicol. Environ. Saf.69: 421-427.
Copper hydroxide (Cu(OH)2)	Smooth Caridina	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Sucahyo, D., N.M. Van Straalen, A. Krave, and C.A.M. Van Gestel. Acute Toxicity of Pesticides to the Tropical Freshwater Shrimp Caridina laevis. Ecotoxicol. Environ. Saf.69: 421-427.
Copper chloride (CuCl2)	Snail	Molluscs	Fresh	Growth	EC50	Not Reported	T	13	NA	NR	ug/L	LAB	1995. Dorgelo, J., H. Meester, and C. Van Velzen. Effects of Diet and Heavy Metals on Growth Rate and Fertility in the Deposit-Feeding Snail Potamopyrgus jenkinsi (Smith) (Gastropoda: Hydrobiidae). Hydrobiologia316(3): 199-210.
Copper	Snail	Molluscs	Fresh	Growth	LOEC	Shell	T	67.5	NR	NR	ug/L	LAB	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.
Copper chloride (CuCl2)	Snail	Molluscs	Fresh	Growth	LOEC	Not Reported	T	11.7	NA	NR	ug/L	LAB	1995. Dorgelo, J., H. Meester, and C. Van Velzen. Effects of Diet and Heavy Metals on Growth Rate and Fertility in the Deposit-Feeding Snail Potamopyrgus jenkinsi (Smith) (Gastropoda: Hydrobiidae). Hydrobiologia316(3): 199-210.
Copper chloride	Snail	Molluscs	Fresh	Growth	LOEL	Not Reported	T	44		NR	ug/L	LAB	2003. Real, M., I. Munoz, H. Guasch, E. Navarro, and S. Sabater. The Effect of Copper Exposure on a Simple Aquatic Food Chain. Aquat. Toxicol.63(3): 283-291.
Copper	Snail	Molluscs	Fresh	Growth	NOEC	Shell	T	45	NR	NR	ug/L	LAB	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.
Copper	Snail	Molluscs	Fresh	Growth	NOEC	Shell	T	67.5	NR	NR	ug/L	LAB	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.
Copper	Snail	Molluscs	Fresh	Growth	NOEC	Shell	T	67.5	NR	NR	ug/L	LAB	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.
Copper	Snail	Molluscs	Fresh	Growth	NOEC	Shell	T	67.5	NR	NR	ug/L	LAB	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.
Copper	Snail	Molluscs	Fresh	Growth	NOEC	Shell	T	67.5	NR	NR	ug/L	LAB	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.
Copper chloride (CuCl2)	Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1995. Dorgelo, J., H. Meester, and C. Van Velzen. Effects of Diet and Heavy Metals on Growth Rate and Fertility in the Deposit-Feeding Snail Potamopyrgus jenkinsi (Smith) (Gastropoda: Hydrobiidae). Hydrobiologia316(3): 199-210.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Growth	NR	Not Reported	T	24	NR	NR	ug/L	LAB	2006. Ragab, F.M.A., and N.M. Shoukry. Influence of Certain Fertilizers on the Activity of Some Molluscicides Against Biomphalaria alexandrina and Lymnaea natalensis Snails. J. Egypt. Soc. Parasitol.36(3): 959-977.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Growth	NR		T	24*	NA	NR	ug/L	LAB	1977. Cheng, T.C., and J.T. Sullivan. Alterations in Osmoregulation of the Pulmonate Gastropod Biomphalaria glabrata due to Copper. J. Invertebr. Pathol.29(1): 101-104.
Copper oxide (Cu2O)	Snail	Molluscs	Fresh	Mortality	LC10	Not Reported	T	35		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC10	Not Reported	T	40		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC100	Not Reported	T	8500*	NA	NR	ug/L	LAB	1975. Muraleedharan, K., S.P. Kumar, K.S. Hedge, and V.S. Alwar. Relative Efficiency of Copper Sulphate, Sodium Pentachlorophenate and Bayluscide Against Freshwater Snail Indoplanorbis exustus. Indian J. Anim. Sci.45(10): 739-743.
Copper chloride	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.
Copper chloride	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.
Copper chloride (CuCl)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Copper chloride (CuCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	6200	NR	NR	ug/L	LAB	2008. Hammami, H., and A. Ayadi. Molluscicidal and Antiparasitic Activity of Solanum nigrum villosum Against Galba truncatula Infected or Uninfected with Fasciola hepatica. J. Helminthol.82(3): 235-239.
Copper hydroxide (Cu(OH)2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	520	NA	NR	ug/L	LAB	1972. Nishiuchi, Y., and K. Yoshida. Toxicities of Pesticides to Some Fresh Water Snails. Bull.Agric.Chem.Insp.Stn.(Tokyo)12: 86-92.
Copper oxide (Cu2O)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	179		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Nitric acid, Copper(2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Copper(2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Copper(2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Copper(2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Copper(2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Copper(2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3300	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	480	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	450		NC	ug/L	LAB	1985. Gopal, C., and M. Balaparameswara Rao. Copper and Zinc Toxicity and Their Effect on the Activity of the Digestive Enzymes in the Freshwater Snail, Beliamya bengalensis f. annandalei (Kobelt) (Gastropoda: Viviparidae). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 265-281.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11	NA	NR	ug/L	LAB	1987. Rao, M.B., and N. Jayasree. Toxicity of Copper and Zinc to Adults and Juveniles of the Freshwater Prosobranch Snail Bellamya dissimilis (Muller). In: K.S.Rao and S.Shrivasta (Eds.), Perspectives in Hydrobiology Symp., Feb.8-10, 1986, Ujjain, India: 75-80.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1987. Rao, M.B., and N. Jayasree. Toxicity of Copper and Zinc to Adults and Juveniles of the Freshwater Prosobranch Snail Bellamya dissimilis (Muller). In: K.S.Rao and S.Shrivasta (Eds.), Perspectives in Hydrobiology Symp., Feb.8-10, 1986, Ujjain, India: 75-80.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	420		NC	ug/L	LAB	2002. Zidan, Z.H., F.M.A. Ragab, and K.H.A. Mohamed. Molluscicidal Activities of Certain Pesticide and Their Mixtures Against Biomphalaria alexandrina. J. Egypt. Soc. Parasitol.32(1): 285-286.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2900		NC	ug/L	LAB	2008. Radwan, M.A., S.R. El-Zemity, S.A. Mohamed, and S.M. Sherby. Potential of Some Monoterpenoids and Their New N-Methyl Carbamate Derivatives Against Schistosomiasis Snail Vector, Biomphalaria alexandrina. Ecotoxicol. Environ. Saf.71(3): 889-894.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	2006. Ragab, F.M.A., and N.M. Shoukry. Influence of Certain Fertilizers on the Activity of Some Molluscicides Against Biomphalaria alexandrina and Lymnaea natalensis Snails. J. Egypt. Soc. Parasitol.36(3): 959-977.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	420	NR	NR	ug/L	LAB	2003. Kader, A.A., B.B. Mostafa, F.M.A. Ragab, K.M. El-Said, A.A. Tantawy, and H.M.M. El-Khayat. Influence of Some Natural and Synthetic Substances on Certain Fresh Water Organisms and the Snail Vectors of Schistosomiasis and Fascioliasis. Egypt.J.Schistosomiasis Infect.Endem.Dis., Natl.Inf.and Doc.Ctr.(NIDOC), Cairo, Egypt25: 53-65.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	420	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1200	NR	NR	ug/L	LAB	2008. Hassan, A.A., N.M. Shoukary, and N.M.M. Ismail. Efficacy of Temperature, and Two Commonly Used Molluscicides and Fertilizers on Fasciola gigantica Eggs. J. Egypt. Soc. Parasitol.38(2): 621-634.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	191		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	1993. Al-Sabri, I.Y.N., J.D. Smith, and J.D. Thomas. Copper Molluscicides for Control of Schistosomiasis. 3. Adsorption by Clay Suspensions. Environ. Sci. Technol.27(2): 299-303.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	560	NR	NR	ug/L	LAB	1991. O'Sullivan, T.N., J.D. Smith, J.D. Thomas, and C. Drake. Copper Molluscicides for Control of Schistosomiasis. 2. Copper Phosphate Controlled Release Glass. Environ. Sci. Technol.25(6): 1088-1091.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	44	NR	NR	ug/L	LAB	1993. Al-Sabri, I.Y.N., J.D. Smith, and J.D. Thomas. Copper Molluscicides for Control of Schistosomiasis. 3. Adsorption by Clay Suspensions. Environ. Sci. Technol.27(2): 299-303.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	211	NR	NR	ug/L	LAB	1994. Lai, P.C.C., and P.K.S. Lam. Scope for Growth in a Tropical Freshwater Snail, Brotia hainanensis: Implications for Monitoring Sublethal Toxic Stressors. Mitt. Int. Ver. Limnol.24: 315-320.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	707	NA	NR	ug/L	LAB	1990. Ebele, S., A.A. Oladimeji, and J.A. Daramola. Molluscicidal and Piscicidal Properties of Copper(II) Tetraoxosulfate(VI) on Bulinus globosus (Morelet) and Clarias anguillaris (L.). Aquat. Toxicol.17(3): 231-238.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	1981. Van Aardt, W.J., and D.J. Coertze. Influence of Copper Sulphate on the Water and Electrolyte Balance of the Freshwater Snail Bulinus (Bulinus) tropicus. S. Afr. J. Zool.16(4): 193-199.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1500	NR	NR	ug/L	LAB	1981. Van Aardt, W.J., and D.J. Coertze. Influence of Copper Sulphate on the Water and Electrolyte Balance of the Freshwater Snail Bulinus (Bulinus) tropicus. S. Afr. J. Zool.16(4): 193-199.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	1981. Van Aardt, W.J., and D.J. Coertze. Influence of Copper Sulphate on the Water and Electrolyte Balance of the Freshwater Snail Bulinus (Bulinus) tropicus. S. Afr. J. Zool.16(4): 193-199.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	0.021*	NA	NR	ug/L	LAB	1978. Goel, H.C., and R. Prasad. Action of Molluscicides on Freshly Laid Eggs of the Snail Indoplanorbis exustus (Deshayes). Indian J. Exp. Biol.16(5): 620-622.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	300*	NA	NR	ug/L	LAB	1981. Goel, H.C., and C.P. Srivastava. Laboratory Evaluation of Some Molluscicides Against Fresh Water Snails, Indoplanorbis and Lymnaea Species. J. Commun. Dis.13(2): 121-127.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	290*	NA	NR	ug/L	LAB	1972. Nishiuchi, Y., and K. Yoshida. Toxicities of Pesticides to Some Fresh Water Snails. Bull.Agric.Chem.Insp.Stn.(Tokyo)12: 86-92.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3600	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	41	NA	NR	ug/L	LAB	1984. Skidmore, J.F., and I.C. Firth. Prediction of the Toxicity of Copper to Australian Freshwater Animals. In: D.Pascoe and R.W.Edwards (Eds.), Freshwater Biological Monitoring.Proc.Specialized Conf.Int.Assoc.on Water Pollution Research and Control, Pergamon Press, New York, NY: 93-100.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1984. Skidmore, J.F., and I.C. Firth. Prediction of the Toxicity of Copper to Australian Freshwater Animals. In: D.Pascoe and R.W.Edwards (Eds.), Freshwater Biological Monitoring.Proc.Specialized Conf.Int.Assoc.on Water Pollution Research and Control, Pergamon Press, New York, NY: 93-100.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	112	NA	NR	ug/L	LAB	1984. Watton, A.J., and H.A. Hawkes. The Acute Toxicity of Ammonia and Copper to the Gastropod Potamopyrgus jenkinsi (Smith). Environ. Pollut. A.36(1): 17-29.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1984. Watton, A.J., and H.A. Hawkes. The Acute Toxicity of Ammonia and Copper to the Gastropod Potamopyrgus jenkinsi (Smith). Environ. Pollut. A.36(1): 17-29.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	87	NA	NR	ug/L	LAB	1984. Watton, A.J., and H.A. Hawkes. The Acute Toxicity of Ammonia and Copper to the Gastropod Potamopyrgus jenkinsi (Smith). Environ. Pollut. A.36(1): 17-29.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	54	NA	NR	ug/L	LAB	1984. Watton, A.J., and H.A. Hawkes. The Acute Toxicity of Ammonia and Copper to the Gastropod Potamopyrgus jenkinsi (Smith). Environ. Pollut. A.36(1): 17-29.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	77	NA	NR	ug/L	LAB	1984. Watton, A.J., and H.A. Hawkes. The Acute Toxicity of Ammonia and Copper to the Gastropod Potamopyrgus jenkinsi (Smith). Environ. Pollut. A.36(1): 17-29.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	79	NA	NR	ug/L	LAB	1984. Watton, A.J., and H.A. Hawkes. The Acute Toxicity of Ammonia and Copper to the Gastropod Potamopyrgus jenkinsi (Smith). Environ. Pollut. A.36(1): 17-29.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	15000	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2160	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2550	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5020	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2160	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1330	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1360*	NA	NR	ug/L	LAB	1990. Seth, R.N., R.K. Tyagi, and R.S. Panwar. Toxicity of 2-Methoxy Ethyl Mercuric Chloride, Copper Sulphate and Mercuric Chloride to Freshwater Snail, Viviparus bengalensis (Swainson). J. Environ. Biol.11(3): 263-267.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	13930	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2150	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	540	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1330	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1270	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7800	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	93	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	84	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	850	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	390	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	66	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	88	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. The Temperature Dependence of the Acute Toxicity of Copper to a Freshwater Pond Snail, Viviparus bengalensis L.. Hydrobiologia83(3): 461-464.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	960*	NA	NR	ug/L	LAB	1990. Seth, R.N., R.K. Tyagi, and R.S. Panwar. Toxicity of 2-Methoxy Ethyl Mercuric Chloride, Copper Sulphate and Mercuric Chloride to Freshwater Snail, Viviparus bengalensis (Swainson). J. Environ. Biol.11(3): 263-267.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	88	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Copper chloride (CuCl2)	Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	11300	NR	NR	ug/L	LAB	2008. Hammami, H., and A. Ayadi. Molluscicidal and Antiparasitic Activity of Solanum nigrum villosum Against Galba truncatula Infected or Uninfected with Fasciola hepatica. J. Helminthol.82(3): 235-239.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	1500	NR	NR	ug/L	LAB	2003. Kader, A.A., B.B. Mostafa, F.M.A. Ragab, K.M. El-Said, A.A. Tantawy, and H.M.M. El-Khayat. Influence of Some Natural and Synthetic Substances on Certain Fresh Water Organisms and the Snail Vectors of Schistosomiasis and Fascioliasis. Egypt.J.Schistosomiasis Infect.Endem.Dis., Natl.Inf.and Doc.Ctr.(NIDOC), Cairo, Egypt25: 53-65.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	760	NR	NR	ug/L	LAB	2006. Ragab, F.M.A., and N.M. Shoukry. Influence of Certain Fertilizers on the Activity of Some Molluscicides Against Biomphalaria alexandrina and Lymnaea natalensis Snails. J. Egypt. Soc. Parasitol.36(3): 959-977.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	1500	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	1750	NR	NR	ug/L	LAB	2008. Hassan, A.A., N.M. Shoukary, and N.M.M. Ismail. Efficacy of Temperature, and Two Commonly Used Molluscicides and Fertilizers on Fasciola gigantica Eggs. J. Egypt. Soc. Parasitol.38(2): 621-634.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	6000	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	3480	NA	NR	ug/L	LAB	1990. Estebenet, A.L., and N.J. Cazzaniga. Effect of Short-Term Exposure to Copper on Survival of Apple-Snails in an Integrated Control Program. J. Aquat. Plant Manage.28(2): 103-105.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC90	Not Reported	T	5050	NA	NR	ug/L	LAB	1990. Estebenet, A.L., and N.J. Cazzaniga. Effect of Short-Term Exposure to Copper on Survival of Apple-Snails in an Integrated Control Program. J. Aquat. Plant Manage.28(2): 103-105.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC99.5	Not Reported	T	10000	NR	NR	ug/L	LAB	1967. Jobin, W.R., and G.O. Unrau. Chemical Control of Australorbis glabratus. Public Health Rep82(1): 63-71.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC99.5	Not Reported	T	2500	NR	NR	ug/L	LAB	1967. Jobin, W.R., and G.O. Unrau. Chemical Control of Australorbis glabratus. Public Health Rep82(1): 63-71.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC99.5	Not Reported	T	1100	NR	NR	ug/L	LAB	1967. Jobin, W.R., and G.O. Unrau. Chemical Control of Australorbis glabratus. Public Health Rep82(1): 63-71.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC99.5	Not Reported	T	250	NR	NR	ug/L	LAB	1967. Jobin, W.R., and G.O. Unrau. Chemical Control of Australorbis glabratus. Public Health Rep82(1): 63-71.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	LD90	Not Reported	T	1550		NC	ug/L	LAB	2002. Zidan, Z.H., F.M.A. Ragab, and K.H.A. Mohamed. Molluscicidal Activities of Certain Pesticide and Their Mixtures Against Biomphalaria alexandrina. J. Egypt. Soc. Parasitol.32(1): 285-286.
Copper chloride	Snail	Molluscs	Fresh	Mortality	LOEL	Not Reported	T	44		NR	ug/L	LAB	2003. Real, M., I. Munoz, H. Guasch, E. Navarro, and S. Sabater. The Effect of Copper Exposure on a Simple Aquatic Food Chain. Aquat. Toxicol.63(3): 283-291.
Copper chloride	Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	6	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.
Copper	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.
Copper	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.
Copper	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.
Copper chloride	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	44		NC	ug/L	LAB	2003. Real, M., I. Munoz, H. Guasch, E. Navarro, and S. Sabater. The Effect of Copper Exposure on a Simple Aquatic Food Chain. Aquat. Toxicol.63(3): 283-291.
Copper chloride (CuCl)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Copper chloride (CuCl)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	30000	NR	NR	ug/L	FIELDA	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Nitric acid, Copper(2+) salt	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	42	NR	NR	ug/L	LAB	2003. Kader, A.A., B.B. Mostafa, F.M.A. Ragab, K.M. El-Said, A.A. Tantawy, and H.M.M. El-Khayat. Influence of Some Natural and Synthetic Substances on Certain Fresh Water Organisms and the Snail Vectors of Schistosomiasis and Fascioliasis. Egypt.J.Schistosomiasis Infect.Endem.Dis., Natl.Inf.and Doc.Ctr.(NIDOC), Cairo, Egypt25: 53-65.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	24	NR	NR	ug/L	LAB	2006. Ragab, F.M.A., and N.M. Shoukry. Influence of Certain Fertilizers on the Activity of Some Molluscicides Against Biomphalaria alexandrina and Lymnaea natalensis Snails. J. Egypt. Soc. Parasitol.36(3): 959-977.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	5000*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	8000*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	5000*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1957. Paulini, E., and J. Pellegrino. Influence of Infection with Schistosoma mansoni on the Susceptibility of Australorbis glabratus to Copper Sulphate. Trans. R. Soc. Trop. Med. Hyg.51(3): 283-284.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1957. Paulini, E., and J. Pellegrino. Influence of Infection with Schistosoma mansoni on the Susceptibility of Australorbis glabratus to Copper Sulphate. Trans. R. Soc. Trop. Med. Hyg.51(3): 283-284.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1957. Paulini, E., and J. Pellegrino. Influence of Infection with Schistosoma mansoni on the Susceptibility of Australorbis glabratus to Copper Sulphate. Trans. R. Soc. Trop. Med. Hyg.51(3): 283-284.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1957. Paulini, E., and J. Pellegrino. Influence of Infection with Schistosoma mansoni on the Susceptibility of Australorbis glabratus to Copper Sulphate. Trans. R. Soc. Trop. Med. Hyg.51(3): 283-284.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1957. Paulini, E., and J. Pellegrino. Influence of Infection with Schistosoma mansoni on the Susceptibility of Australorbis glabratus to Copper Sulphate. Trans. R. Soc. Trop. Med. Hyg.51(3): 283-284.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1957. Paulini, E., and J. Pellegrino. Influence of Infection with Schistosoma mansoni on the Susceptibility of Australorbis glabratus to Copper Sulphate. Trans. R. Soc. Trop. Med. Hyg.51(3): 283-284.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1957. Paulini, E., and J. Pellegrino. Influence of Infection with Schistosoma mansoni on the Susceptibility of Australorbis glabratus to Copper Sulphate. Trans. R. Soc. Trop. Med. Hyg.51(3): 283-284.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	1000	NR	NR	ug/L	FIELDA	1967. Jobin, W.R., and G.O. Unrau. Chemical Control of Australorbis glabratus. Public Health Rep82(1): 63-71.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	1000	NR	NR	ug/L	FIELDA	1967. Jobin, W.R., and G.O. Unrau. Chemical Control of Australorbis glabratus. Public Health Rep82(1): 63-71.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	10000	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	10000	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	5000	NR	NR	ug/L	FIELDA	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	10000	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	10000	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	10000	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	10000	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	10000	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	1000	NR	NR	ug/L	LAB	1980. Upatham, E.S., M. Koura, M.D. Ahmed, and A.H. Awad. Laboratory Trials of Controlled-Release Molluscicides on Bulinus (Ph.) abyssinicus, the Intermediate Host of Schistosoma haematobium in Somalia. In: R.Baker (Ed.), Controlled Release of Bioactive Materials, Academic Press, NY: 461-469.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1980. Upatham, E.S., M. Koura, M.D. Ahmed, and A.H. Awad. Laboratory Trials of Controlled-Release Molluscicides on Bulinus (Ph.) abyssinicus, the Intermediate Host of Schistosoma haematobium in Somalia. In: R.Baker (Ed.), Controlled Release of Bioactive Materials, Academic Press, NY: 461-469.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	0.5	NR	NR	g	LAB	1976. Chu, K.Y.. Effects of Environmental Factors on the Molluscicidal Activities of Slow-Release Hexabutyldistannoxane and Copper Sulfate. Bull. W. H. O.54(4): 417-420.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	0.5	NR	NR	g	LAB	1976. Chu, K.Y.. Effects of Environmental Factors on the Molluscicidal Activities of Slow-Release Hexabutyldistannoxane and Copper Sulfate. Bull. W. H. O.54(4): 417-420.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	0.5	NR	NR	g	LAB	1976. Chu, K.Y.. Effects of Environmental Factors on the Molluscicidal Activities of Slow-Release Hexabutyldistannoxane and Copper Sulfate. Bull. W. H. O.54(4): 417-420.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	30000	NR	NR	ug/L	FIELDA	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	5000*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	3000*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	100*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	100*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	100*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	200*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	200*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	300*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	3050	NA	NR	ug/L	LAB	1990. Estebenet, A.L., and N.J. Cazzaniga. Effect of Short-Term Exposure to Copper on Survival of Apple-Snails in an Integrated Control Program. J. Aquat. Plant Manage.28(2): 103-105.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	100*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	100*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	200*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Copper	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	1250	NR	NR	ug/L	NR	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.
Copper	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	1250	NR	NR	ug/L	NR	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.
Copper chloride (CuCl)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	30000	NR	NR	ug/L	FIELDA	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Copper chloride (CuCl)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	16000	NR	NR	ug/L	LAB	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Copper chloride (CuCl)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	25000	NR	NR	ug/L	LAB	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Nitric acid, Copper(2+) salt	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	250	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5000*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	24	NR	NR	ug/L	LAB	2006. Ragab, F.M.A., and N.M. Shoukry. Influence of Certain Fertilizers on the Activity of Some Molluscicides Against Biomphalaria alexandrina and Lymnaea natalensis Snails. J. Egypt. Soc. Parasitol.36(3): 959-977.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	NR	1957. Paulini, E., and J. Pellegrino. Influence of Infection with Schistosoma mansoni on the Susceptibility of Australorbis glabratus to Copper Sulphate. Trans. R. Soc. Trop. Med. Hyg.51(3): 283-284.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NR	NR	ug/L	LAB	1967. Jobin, W.R., and G.O. Unrau. Chemical Control of Australorbis glabratus. Public Health Rep82(1): 63-71.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1967. Jobin, W.R., and G.O. Unrau. Chemical Control of Australorbis glabratus. Public Health Rep82(1): 63-71.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	200	NR	NR	ug/L	LAB	1967. Jobin, W.R., and G.O. Unrau. Chemical Control of Australorbis glabratus. Public Health Rep82(1): 63-71.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	FIELDA	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NR	NR	ug/L	FIELDA	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NR	NR	ug/L	FIELDA	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NR	NR	ug/L	FIELDA	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NR	NR	ug/L	LAB	1957. El-Gindy, M.S.. Laboratory Studies on the Effect of Copper Sulphate on Biomphalaria boissyi, the Snail Vector of Mansoni Schistosomiasis in Egypt. J. Egypt. Med. Assoc.40: 45-53.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	2540	NR	NR	ug/L	LAB	1996. Dregol'skaya, I.N.. Sensitivity of Embryos of Freshwater Molluscs from Various Habitats to a Rise in Concentration of Copper Ions in the Environment. Russ. J. Ecol.24(2): 139-143.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	400	NR	NR	ug/L	LAB	1994. Lai, P.C.C., and P.K.S. Lam. Scope for Growth in a Tropical Freshwater Snail, Brotia hainanensis: Implications for Monitoring Sublethal Toxic Stressors. Mitt. Int. Ver. Limnol.24: 315-320.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	5000*	NA	NR	ug/L	LAB	1988. Abdel-Rahman, M.S., M.M. Fahmy, and M.M. El Bahi. Laboratory Studies on the Efficacy of Some Molluscicides on Egyptian Snails. Dtsch. Tierarztl. Wochenschr.95(5): 205-207.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	30000	NR	NR	ug/L	FIELDA	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	16000	NR	NR	ug/L	LAB	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1975. Shukla, S.S., and R.M. Roy. Studies on the Comparative Molluscicide Effects of N-Tritylmorpholine and Copper Sulphate on the Common Aquatic Snails in Andhra Pradesh (India). Trop. Anim. Health Prod.7(1): 45-50.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1967. Jobin, W.R., and G.O. Unrau. Chemical Control of Australorbis glabratus. Public Health Rep82(1): 63-71.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	200*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	300*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1975. Shukla, S.S., and R.M. Roy. Studies on the Comparative Molluscicide Effects of N-Tritylmorpholine and Copper Sulphate on the Common Aquatic Snails in Andhra Pradesh (India). Trop. Anim. Health Prod.7(1): 45-50.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	100*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	100*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	200*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	300*	NA	NR	ug/L	LAB	1984. Bali, H.S., S. Singh, and D.P. Singh. Trial of Some Molluscicides on Snails Melanoides tuberculatus and Vivipara bengalensis in Laboratory. Indian J. Anim. Sci.54(4): 401-403.
Copper chloride (CuCl)	Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	2000	NR	NR	ug/L	LAB	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	62.5		NC	ug/L	LAB	1985. Gopal, C., and M. Balaparameswara Rao. Copper and Zinc Toxicity and Their Effect on the Activity of the Digestive Enzymes in the Freshwater Snail, Beliamya bengalensis f. annandalei (Kobelt) (Gastropoda: Viviparidae). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 265-281.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	1994. Lai, P.C.C., and P.K.S. Lam. Scope for Growth in a Tropical Freshwater Snail, Brotia hainanensis: Implications for Monitoring Sublethal Toxic Stressors. Mitt. Int. Ver. Limnol.24: 315-320.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	0.5	NR	NR	g	LAB	1976. Chu, K.Y.. Effects of Environmental Factors on the Molluscicidal Activities of Slow-Release Hexabutyldistannoxane and Copper Sulfate. Bull. W. H. O.54(4): 417-420.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	30000	NR	NR	ug/L	FIELDA	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Copper chloride	Snail	Molluscs	Fresh	Reproduction	LOEC	Not Reported	T	44		NC	ug/L	LAB	2003. Real, M., I. Munoz, H. Guasch, E. Navarro, and S. Sabater. The Effect of Copper Exposure on a Simple Aquatic Food Chain. Aquat. Toxicol.63(3): 283-291.
Copper chloride (CuCl2)	Snail	Molluscs	Fresh	Reproduction	LOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Dorgelo, J., H. Meester, and C. Van Velzen. Effects of Diet and Heavy Metals on Growth Rate and Fertility in the Deposit-Feeding Snail Potamopyrgus jenkinsi (Smith) (Gastropoda: Hydrobiidae). Hydrobiologia316(3): 199-210.
Copper chloride	Snail	Molluscs	Fresh	Reproduction	LOEL	Not Reported	T	44		NR	ug/L	LAB	2003. Real, M., I. Munoz, H. Guasch, E. Navarro, and S. Sabater. The Effect of Copper Exposure on a Simple Aquatic Food Chain. Aquat. Toxicol.63(3): 283-291.
Copper	Snail	Molluscs	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Pena, S.C., and G.N. Pocsidio. Influence of Copper on the Feeding Rate, Growth and Reproduction of the Golden Apple Snail, Pomacea canaliculata Lamarck. Bull. Environ. Contam. Toxicol.79(6): 606-608.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Reproduction	NR	Not Reported	T	42	NR	NR	ug/L	LAB	2003. Kader, A.A., B.B. Mostafa, F.M.A. Ragab, K.M. El-Said, A.A. Tantawy, and H.M.M. El-Khayat. Influence of Some Natural and Synthetic Substances on Certain Fresh Water Organisms and the Snail Vectors of Schistosomiasis and Fascioliasis. Egypt.J.Schistosomiasis Infect.Endem.Dis., Natl.Inf.and Doc.Ctr.(NIDOC), Cairo, Egypt25: 53-65.
Sulfuric acid copper(2+) salt (1:1)	Snail	Molluscs	Fresh	Reproduction	NR	Not Reported	T	24	NR	NR	ug/L	LAB	2006. Ragab, F.M.A., and N.M. Shoukry. Influence of Certain Fertilizers on the Activity of Some Molluscicides Against Biomphalaria alexandrina and Lymnaea natalensis Snails. J. Egypt. Soc. Parasitol.36(3): 959-977.
Nitric acid, Copper(2+) salt	Snail, Carib Physa	Molluscs	Fresh	Growth	NR	Not Reported	T	0.005	NA	NR	%	LAB	1993. Hart, S., S. Archie, D.L. Thomas, and J.B. McClintock. The Effects of Copper Nitrate on Growth, Food Consumption, Egg Mass Deposition, and Embryogenesis in the Pulmonate Snail Physella cubensis. J. Ala. Acad. Sci.64(2): 86.
Nitric acid, Copper(2+) salt	Snail, Carib Physa	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	%	LAB	1993. Hart, S., S. Archie, D.L. Thomas, and J.B. McClintock. The Effects of Copper Nitrate on Growth, Food Consumption, Egg Mass Deposition, and Embryogenesis in the Pulmonate Snail Physella cubensis. J. Ala. Acad. Sci.64(2): 86.
Nitric acid, Copper(2+) salt	Snail, Carib Physa	Molluscs	Fresh	Reproduction	NR	Not Reported	T	0.005	NA	NR	%	LAB	1993. Hart, S., S. Archie, D.L. Thomas, and J.B. McClintock. The Effects of Copper Nitrate on Growth, Food Consumption, Egg Mass Deposition, and Embryogenesis in the Pulmonate Snail Physella cubensis. J. Ala. Acad. Sci.64(2): 86.
Sulfuric acid copper(2+) salt (1:1)	Snail, Marsh Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	130*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid copper(2+) salt (1:1)	Snail, Tadpole Physa	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Soucek, D.J., and G.P. Noblet. Copper Toxicity to the Endoparasitic Trematode (Posthodiplostomum minimum) Relative to Physid Snail and Bluegill Sunfish Intermediate Hosts. Environ. Toxicol. Chem.17(12): 2512-2516.
Sulfuric acid copper(2+) salt (1:1)	Snail, Tadpole Physa	Molluscs	Fresh	Mortality	LC50	Not Reported	T	115	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Snail, Tadpole Physa	Molluscs	Fresh	Mortality	LC50	Not Reported	T	48.5	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Snail, Tadpole Physa	Molluscs	Fresh	Mortality	LC50	Not Reported	T	38	NR	NR	ug/L	LAB	1998. Soucek, D.J., and G.P. Noblet. Copper Toxicity to the Endoparasitic Trematode (Posthodiplostomum minimum) Relative to Physid Snail and Bluegill Sunfish Intermediate Hosts. Environ. Toxicol. Chem.17(12): 2512-2516.
Copper chloride (CuCl2)	Snails/Limpets Class	Molluscs	Fresh	Reproduction	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1971. Kapkov, V.T.. Toxicity of Copper Complexes to Freshwater Mollusks. Army Foreign Sci.and Tech.Center, Charlottesville, VA:5 p.(ENG TRANSL) (1973) (U.S.NTIS, AD-763967) / Vest.Mosk.Univ.Biol.Pochvoved26(2): 34-37.
Sulfuric acid copper(2+) salt (1:1)	Snuffbox	Molluscs	Fresh	Mortality	EC50	Not Reported	D	17.6	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Snuffbox	Molluscs	Fresh	Mortality	EC50	Not Reported	D	30.9	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Snuffbox	Molluscs	Fresh	Mortality	EC50	Not Reported	D	7.4	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Snuffbox	Molluscs	Fresh	Mortality	EC50	Not Reported	D	79.7	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Snuffbox	Molluscs	Fresh	Mortality	EC50	Not Reported	D	19	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Snuffbox	Molluscs	Fresh	Mortality	EC50	Not Reported	D	5.2	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Snuffbox	Molluscs	Fresh	Mortality	EC50	Not Reported	D	8.8	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Soil Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5400	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Sulfuric acid copper(2+) salt (1:1)	Soil Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5500	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Sulfuric acid copper(2+) salt (1:1)	Soil Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	8100	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Copper chloride (CuCl2)	Sour Paste Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	160000		NC	ug/L	LAB	2003. Boyd, W.A., and P.L. Williams. Comparison of the Sensitivity of Three Nematode Species to Copper and Their Utility in Aquatic and Soil Toxicity Tests. Environ. Toxicol. Chem.22(11): 2768-2774.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	51	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	65	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	74	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	91	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	351	D	41	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	428	D	51	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	51	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	75	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	65	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	23	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	34	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	35	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	40	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	230	D	24	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	350	D	41	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	11	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	20	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	25	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	D	32	NR	NR	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	182	D	18	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	278	D	27	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	310	D	36	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	429	D	50	ug/L	LAB	1999. Keller, A.E., D.S. Ruessler, and N.J. Kernaghan. Effect of Test Conditions on the Toxicity of Copper to Juvenile Unionid Mussels. In: D.S.Henshel, M.C.Black, and M.C.Harrass (Eds.), Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disuprtion of Environmental Assessment, 8th Volume, ASTM STP 1364, W.Conshohocken, PA: 329-340.
Sulfuric acid copper(2+) salt (1:1)	Southern Rainbow Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	119	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Southern Rainbow Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	20	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Southern Rainbow Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	56	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1650	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1900	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	650	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	680	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Brown, B.E.. Uptake of Copper and Lead by a Metal Tolerant Isopod Asellus meridianus Rac.. Freshw. Biol.7(3): 235-244.
Sulfuric acid copper(2+) salt (1:1)	Sowbug	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Brown, B.E.. Uptake of Copper and Lead by a Metal Tolerant Isopod Asellus meridianus Rac.. Freshw. Biol.7(3): 235-244.
Copper	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	1500	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Copper	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	4500	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Copper	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	900	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Copper	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	9300	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid copper(2+) salt (1:1)	Stonefly	Insects/Spiders	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1976. Kapoor, N.N., and W. Griffiths. The Effect of Copper on the Oxygen Consumption Rates of the Stonefly Nymph, Phasganophora capitata (Pictet) (Plecoptera). Zool. J. Linn. Soc.59(2): 209-215.
Copper	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Sulfuric acid copper(2+) salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	8300	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Sulfuric acid copper(2+) salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Nehring, R.B.. Aquatic Insects as Biological Monitors of Heavy Metal Pollution. Bull. Environ. Contam. Toxicol.15(2): 147-154.
Sulfuric acid copper(2+) salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Sulfuric acid copper(2+) salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Sulfuric acid copper(2+) salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	LETC	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	18500	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Sulfuric acid copper(2+) salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	13900	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Sulfuric acid copper(2+) salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	5640	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Sulfuric acid copper(2+) salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	10400	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Copper	Swan Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Pynnonen, K.. Effect of pH, Hardness and Maternal Pre-exposure on the Toxicity of Cd, Cu and Zn to the Glochidial Larvae of a Freshwater Clam Anodonta cygnea. Water Res.29(1): 247-254.
Copper	Swan Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Pynnonen, K.. Effect of pH, Hardness and Maternal Pre-exposure on the Toxicity of Cd, Cu and Zn to the Glochidial Larvae of a Freshwater Clam Anodonta cygnea. Water Res.29(1): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Swan Mussel	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	400*	NA	NR	ug/L	LAB	1976. Salanki, J., and I. Varanka. Effect of Copper and Lead Compounds on the Activity of the Fresh-Water Mussel. Ann. Inst. Biol. (Tihany) Hung. Acad. Sci.43: 21-27.
Sulfuric acid copper(2+) salt (1:1)	Swan Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	2006. Lopes-Lima, M., G. Moura, B. Pratoomchat, and J. Machado. Correlation Between the Morpho-Cytohistochemistry of the Outer Mantle Epithelium of Anodonta cygnea with Seasonal Variations and Following Pollutant Exposure. Mar. Freshw. Behav. Physiol.39(3): 235-243.
Sulfuric acid copper(2+) salt (1:1)	Trematode	Worms	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2004. Morley, N.J., K.M.Y. Leung, D. Morritt, and M. Crane. Toxicity of Anti-Fouling Biocides to Encysted Metacercariae of Echinoparyphium recurvatum (Digenea: Echinostomatidae) and Their Snail Hosts. Chemosphere56(4): 353-358.
Sulfuric acid copper(2+) salt (1:1)	Trematode	Worms	Fresh	Mortality	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2004. Morley, N.J., K.M.Y. Leung, D. Morritt, and M. Crane. Toxicity of Anti-Fouling Biocides to Encysted Metacercariae of Echinoparyphium recurvatum (Digenea: Echinostomatidae) and Their Snail Hosts. Chemosphere56(4): 353-358.
Sulfuric acid copper(2+) salt (1:1)	Trematode Parasite	Worms	Fresh	Mortality	LC50	Not Reported	T	8500	NR	NR	ug/L	LAB	1982. Viyanant, V., S. Thirachantra, and S. Sornmani. The Effect of Controlled Release Copper Sulfate and Tributyltin Fluoride on the Mortality and Infectivity of Schistosoma mansoni Miracidia. Southeast Asian J. Trop. Med. Public Health13(2): 225-230.
Sulfuric acid copper(2+) salt (1:1)	Trematode Parasite	Worms	Fresh	Mortality	LC50	Not Reported	T	1.18	NR	NR	mg/L/h	LAB	1982. Viyanant, V., S. Thirachantra, and S. Sornmani. The Effect of Controlled Release Copper Sulphate and Tributyltin Fluoride on the Mortality and Infectivity of Schistosoma mansoni Cercariae. J. Helminthol.56(2): 85-92.
Sulfuric acid copper(2+) salt (1:1)	Trematode Parasite	Worms	Fresh	Mortality	LC90	Not Reported	T	15700	NR	NR	ug/L	LAB	1982. Viyanant, V., S. Thirachantra, and S. Sornmani. The Effect of Controlled Release Copper Sulfate and Tributyltin Fluoride on the Mortality and Infectivity of Schistosoma mansoni Miracidia. Southeast Asian J. Trop. Med. Public Health13(2): 225-230.
Sulfuric acid copper(2+) salt (1:1)	Trematode Parasite	Worms	Fresh	Mortality	LC90	Not Reported	T	1.82	NR	NR	mg/L/h	LAB	1982. Viyanant, V., S. Thirachantra, and S. Sornmani. The Effect of Controlled Release Copper Sulphate and Tributyltin Fluoride on the Mortality and Infectivity of Schistosoma mansoni Cercariae. J. Helminthol.56(2): 85-92.
Sulfuric acid copper(2+) salt (1:1)	Trematode Parasite	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Viyanant, V., S. Thirachantra, and S. Sornmani. The Effect of Controlled Release Copper Sulfate and Tributyltin Fluoride on the Mortality and Infectivity of Schistosoma mansoni Miracidia. Southeast Asian J. Trop. Med. Public Health13(2): 225-230.
Sulfuric acid copper(2+) salt (1:1)	Trematode Parasite	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	32000	NR	NR	ug/L	LAB	1982. Viyanant, V., S. Thirachantra, and S. Sornmani. The Effect of Controlled Release Copper Sulfate and Tributyltin Fluoride on the Mortality and Infectivity of Schistosoma mansoni Miracidia. Southeast Asian J. Trop. Med. Public Health13(2): 225-230.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	1199		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	303		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	323		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	7989		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	154		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	52		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	649		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	93		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	106		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	38		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	523		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	67		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	116		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	239		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	31.1		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	340		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	52		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	615		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	92.3		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	97		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	90	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	100	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	100	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	100	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	60	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	70	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC10	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	100	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	110	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	110	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	120	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	60	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	60	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	90	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC15	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Copper chloride (CuCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC25	Not Reported	T	57		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	70	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	90	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	60	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC5	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Copper	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.4	NA	NR	ug/L	LAB	1993. Das, S.S.M., V.R.P. Smith, O.P.B. Padma, and S. Prasannakumar. Effect of Copper and Retting Toxicity on Tubifex tubifex. Environ. Ecol.11(1): 128-129.
Copper	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.3	NA	NR	ug/L	LAB	1993. Das, S.S.M., V.R.P. Smith, O.P.B. Padma, and S. Prasannakumar. Effect of Copper and Retting Toxicity on Tubifex tubifex. Environ. Ecol.11(1): 128-129.
Copper	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.25	NA	NR	ug/L	LAB	1993. Das, S.S.M., V.R.P. Smith, O.P.B. Padma, and S. Prasannakumar. Effect of Copper and Retting Toxicity on Tubifex tubifex. Environ. Ecol.11(1): 128-129.
Copper	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.24	NA	NR	ug/L	LAB	1993. Das, S.S.M., V.R.P. Smith, O.P.B. Padma, and S. Prasannakumar. Effect of Copper and Retting Toxicity on Tubifex tubifex. Environ. Ecol.11(1): 128-129.
Copper	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.21	NA	NR	ug/L	LAB	1993. Das, S.S.M., V.R.P. Smith, O.P.B. Padma, and S. Prasannakumar. Effect of Copper and Retting Toxicity on Tubifex tubifex. Environ. Ecol.11(1): 128-129.
Copper	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.17	NA	NR	ug/L	LAB	1993. Das, S.S.M., V.R.P. Smith, O.P.B. Padma, and S. Prasannakumar. Effect of Copper and Retting Toxicity on Tubifex tubifex. Environ. Ecol.11(1): 128-129.
Copper	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.16	NA	NR	ug/L	LAB	1993. Das, S.S.M., V.R.P. Smith, O.P.B. Padma, and S. Prasannakumar. Effect of Copper and Retting Toxicity on Tubifex tubifex. Environ. Ecol.11(1): 128-129.
Copper	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	0.15	NA	NR	ug/L	LAB	1993. Das, S.S.M., V.R.P. Smith, O.P.B. Padma, and S. Prasannakumar. Effect of Copper and Retting Toxicity on Tubifex tubifex. Environ. Ecol.11(1): 128-129.
Copper chloride (CuCl)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	15220	NR	NR	ug/L	LAB	2009. Gerhardt, A.. Screening the Toxicity of Ni, Cd, Cu, Ivermectin, and Imidacloprid in a Short-Term Automated Behavioral Toxicity Test with Tubifex tubifex (Muller 1774) (Oligochaeta). Hum. Ecol. Risk Assess.15(1): 27-40.
Copper chloride (CuCl)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	21	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Copper chloride (CuCl)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	12	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Copper chloride (CuCl)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	6	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Copper chloride (CuCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	160		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Copper chloride (CuCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	78		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	490	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	860	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2004. Khangarot, B.S., and R.S. Rathore. Protective Action of 24 Amino Acids on the Toxicity of Copper to a Freshwater Tubificid Worm Tubifex tubifex Muller. Water Air Soil Pollut.157(1-4): 53-63.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1380	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	280	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	5	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	2004. Khangarot, B.S., and R.S. Rathore. Protective Action of 24 Amino Acids on the Toxicity of Copper to a Freshwater Tubificid Worm Tubifex tubifex Muller. Water Air Soil Pollut.157(1-4): 53-63.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	6.4	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	890	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	190	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	5	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	2004. Khangarot, B.S., and R.S. Rathore. Protective Action of 24 Amino Acids on the Toxicity of Copper to a Freshwater Tubificid Worm Tubifex tubifex Muller. Water Air Soil Pollut.157(1-4): 53-63.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1996. Reynoldson, T.B., P. Rodriguez, and M.M. Madrid. A Comparison of Reproduction, Growth and Acute Toxicity in Two Populations of Tubifex tubifex (Muller, 1774) from the North American Great Lakes and Northern Spain. Hydrobiologia334(1-3): 199-206.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	2004. Khangarot, B.S., and R.S. Rathore. Protective Action of 24 Amino Acids on the Toxicity of Copper to a Freshwater Tubificid Worm Tubifex tubifex Muller. Water Air Soil Pollut.157(1-4): 53-63.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	2	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	160	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	160	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	320	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	320	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	70	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	160	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	70	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	70	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	160	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	160	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	30	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2009. Maestre, Z., M. Martinez-Madrid, and P. Rodriguez. Monitoring the Sensitivity of the Oligochaete Tubifex tubifex in Laboratory Cultures Using Three Toxicants. Ecotoxicol. Environ. Saf.72: 2083-2089.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	320		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	560		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	560		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	1000		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	320	NR	NR	ug/L	LAB	2004. Khangarot, B.S., and R.S. Rathore. Protective Action of 24 Amino Acids on the Toxicity of Copper to a Freshwater Tubificid Worm Tubifex tubifex Muller. Water Air Soil Pollut.157(1-4): 53-63.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1980. Fischer, E., J. Filip, and L. Molnar. The Effect of Bivalent Heavy Metals on the Oxygen-Dependent Nuclear Volume Alterations of the Chloragocytes in Tubifex tubifex Mull. Environ. Pollut. A.23(4): 261-265.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	56		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	18		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	100		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	32		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	320		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	56		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	200	NR	NR	ug/L	LAB	2006. Mosleh, Y.Y., S. Paris-Palacios, and S. Biagianti-Risbourg. Metallothioneins Induction and Antioxidative Response in Aquatic Worms Tubifex tubifex (Oligochaeta, Tubificidae) Exposed to Copper. Chemosphere64(1): 121-128.
Copper chloride (CuCl2)	Tubificid Worm	Worms	Fresh	Reproduction	IC25	Not Reported	T	37		NC	ug/L	LAB	2003. Milani, D., T.B. Reynoldson, U. Borgmann, and J. Kolasa. The Relative Sensitivity of Four Benthic Invertebrates to Metals in Spiked-Sediment Exposures and Application to Contaminated Field Sediment. Environ. Toxicol. Chem.22(4): 845-854.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	590	NA	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	420	NA	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Sulfuric acid copper(2+) salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Copper	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	2450	NA	NR	ug/L	LAB	1974. See, C.L., A.L.,Jr. Buikema, and J.,Jr. Cairns. The Effects of Selected Toxicants on Survival of Dugesia tigrina (Turbellaria). ASB (Assoc. Southeast. Biol.) Bull.21(2): 82.
Sulfuric acid copper(2+) salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	430	NR	NR	ug/L	LAB	1988. Rauscher, J.D.. Toxic Effects of Selenium and Copper on the Planarian, Dugesia dorotocephala. Ph.D Thesis, Colorado State Univ., Boulder, CO: 184 p..
Sulfuric acid copper(2+) salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	360	NR	NR	ug/L	LAB	1988. Rauscher, J.D.. Toxic Effects of Selenium and Copper on the Planarian, Dugesia dorotocephala. Ph.D Thesis, Colorado State Univ., Boulder, CO: 184 p..
Sulfuric acid copper(2+) salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	230	NR	NR	ug/L	LAB	1988. Rauscher, J.D.. Toxic Effects of Selenium and Copper on the Planarian, Dugesia dorotocephala. Ph.D Thesis, Colorado State Univ., Boulder, CO: 184 p..
Sulfuric acid copper(2+) salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	190	NR	NR	ug/L	LAB	1988. Rauscher, J.D.. Toxic Effects of Selenium and Copper on the Planarian, Dugesia dorotocephala. Ph.D Thesis, Colorado State Univ., Boulder, CO: 184 p..
Sulfuric acid copper(2+) salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..
Sulfuric acid copper(2+) salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	9360	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..
Sulfuric acid copper(2+) salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	1770	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..
Sulfuric acid copper(2+) salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	1300*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid copper(2+) salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	800	NR	NR	ug/L	LAB	1988. Rauscher, J.D.. Toxic Effects of Selenium and Copper on the Planarian, Dugesia dorotocephala. Ph.D Thesis, Colorado State Univ., Boulder, CO: 184 p..
Sulfuric acid copper(2+) salt (1:1)	Wandering Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2004. Morley, N.J., K.M.Y. Leung, D. Morritt, and M. Crane. Toxicity of Anti-Fouling Biocides to Encysted Metacercariae of Echinoparyphium recurvatum (Digenea: Echinostomatidae) and Their Snail Hosts. Chemosphere56(4): 353-358.
Copper	Washboard Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	180	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Washboard Mussel	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	60	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	EC10	Carapace	T	10.9		NC	ug/L	LAB	2001. Knops, M., R. Altenburger, and H. Segner. Alterations of Physiological Energetics, Growth and Reproduction of Daphnia magna Under Toxicant Stress. Aquat. Toxicol.53(2): 79-90.
Copper chloride	Water Flea	Crustaceans	Fresh	Growth	EC50	Whole Organism	T	358	NR	NR	ug/L	LAB	2006. Dekker, T., G.D. Greve, T.L. Ter Laak, M.E. Boivin, B. Veuger, G. Gortzak, S. Dumfries, S.M.G. Lucker, M.H.S. Kraak, W.. Development and Application of a Sediment Toxicity Test Using the Benthic Cladoceran Chydorus sphaericus. Environ. Pollut.140(2): 231-238.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	IC25	Not Reported	T	51000	NR	NR	ug/L	LAB	2005. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, T. Augspurger, T.J. Canfield, D.R. Mount, and F.L.. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part III. Effluent Toxicity Tests. Arch. Environ. Contam. Toxicol.48(2): 174-183.
Copper	Water Flea	Crustaceans	Fresh	Growth	LOEC	s, protuberant stru	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	90	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	D	150	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	15	NR	NR	ug/L	LAB	2006. Lopes, I., D.J. Baird, and R. Ribeiro. Genetic Adaptation to Metal Stress by Natural Populations of Daphnia longispina. Ecotoxicol. Environ. Saf.63(2): 275-285.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	60	NR	NR	ug/L	LAB	2006. Lopes, I., D.J. Baird, and R. Ribeiro. Genetic Adaptation to Metal Stress by Natural Populations of Daphnia longispina. Ecotoxicol. Environ. Saf.63(2): 275-285.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	60	NR	NR	ug/L	LAB	2006. Lopes, I., D.J. Baird, and R. Ribeiro. Genetic Adaptation to Metal Stress by Natural Populations of Daphnia longispina. Ecotoxicol. Environ. Saf.63(2): 275-285.
Copper	Water Flea	Crustaceans	Fresh	Growth	LOEL	Not Reported	T	32		NC	ug/L	LAB	2003. Khangarot, B.S., and R.S. Rathore. Effects of Copper on Respiration, Reproduction, and Some Biochemical Parameters of Water Flea Daphnia magna Straus. Bull. Environ. Contam. Toxicol.70(1): 112-117.
Copper	Water Flea	Crustaceans	Fresh	Growth	LOEL	Not Reported	T	32		NC	ug/L	LAB	2003. Khangarot, B.S., and R.S. Rathore. Effects of Copper on Respiration, Reproduction, and Some Biochemical Parameters of Water Flea Daphnia magna Straus. Bull. Environ. Contam. Toxicol.70(1): 112-117.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEL	Not Reported	T	90	NR	NR	ug/L	LAB	2001. Atienzar, F.A., V.V. Cheung, A.N. Jha, and M.H. Depledge. Fitness Parameters and DNA Effects are Sensitive Indicators of Copper-Induced Toxicity in Daphnia magna. Toxicol. Sci.59(2): 241-250.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEL	Whole Organism	T	NR	NR	NR	ug	LAB	2007. De Schamphelaere, K.A.C., I. Forrez, K. Dierckens, P. Sorgeloos, and C.R. Janssen. Chronic Toxicity of Dietary Copper to Daphnia magna. Aquat. Toxicol.81(4): 409-418.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	LOEL	Whole Organism	T	32	NR	NR	ug/L	LAB	2007. Hoang, T.C., J.S. Gallagher, J.R. Tomasso, and S.J. Klaine. Toxicity of Two Pulsed Metal Exposures to Daphnia magna: Relative Effects of Pulsed Duration-Concentration and Influence of Interpulse Period. Arch. Environ. Contam. Toxicol.53(4): 579-589.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	LOEL	Whole Organism	T	64	NR	NR	ug/L	LAB	2007. Hoang, T.C., J.S. Gallagher, J.R. Tomasso, and S.J. Klaine. Toxicity of Two Pulsed Metal Exposures to Daphnia magna: Relative Effects of Pulsed Duration-Concentration and Influence of Interpulse Period. Arch. Environ. Contam. Toxicol.53(4): 579-589.
Copper	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	75	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	D	100	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	30	NR	NR	ug/L	LAB	2006. Lopes, I., D.J. Baird, and R. Ribeiro. Genetic Adaptation to Metal Stress by Natural Populations of Daphnia longispina. Ecotoxicol. Environ. Saf.63(2): 275-285.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	30	NR	NR	ug/L	LAB	2006. Lopes, I., D.J. Baird, and R. Ribeiro. Genetic Adaptation to Metal Stress by Natural Populations of Daphnia longispina. Ecotoxicol. Environ. Saf.63(2): 275-285.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	D	67	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	D	67	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	D	67	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	D	67	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	D	67	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	D	67	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	D	67	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	D	67	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	D	67	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	5	NA	NR	ug/L	LAB	1982. Ingersoll, C.G., and R.W. Winner. Effect on Daphnia pulex (De Geer) of Daily Pulse Exposures to Copper or Cadmium. Environ. Toxicol. Chem.1: 321-327.
Copper	Water Flea	Crustaceans	Fresh	Growth	NOEL	Not Reported	T	10		NC	ug/L	LAB	2003. Khangarot, B.S., and R.S. Rathore. Effects of Copper on Respiration, Reproduction, and Some Biochemical Parameters of Water Flea Daphnia magna Straus. Bull. Environ. Contam. Toxicol.70(1): 112-117.
Copper	Water Flea	Crustaceans	Fresh	Growth	NOEL	Not Reported	T	10		NC	ug/L	LAB	2003. Khangarot, B.S., and R.S. Rathore. Effects of Copper on Respiration, Reproduction, and Some Biochemical Parameters of Water Flea Daphnia magna Straus. Bull. Environ. Contam. Toxicol.70(1): 112-117.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Not Reported	T	60	NR	NR	ug/L	LAB	2001. Atienzar, F.A., V.V. Cheung, A.N. Jha, and M.H. Depledge. Fitness Parameters and DNA Effects are Sensitive Indicators of Copper-Induced Toxicity in Daphnia magna. Toxicol. Sci.59(2): 241-250.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Not Reported	D	130	NR	NR	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Chronic Dietary Copper Exposure on Growth and Reproduction of Daphnia magna. Environ. Toxicol. Chem.23(8): 2038-2047.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	D	183	NR	NR	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Chronic Dietary Copper Exposure on Growth and Reproduction of Daphnia magna. Environ. Toxicol. Chem.23(8): 2038-2047.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	T	25		NC	ug/L	LAB	2004. Hunter, K., and G. Pyle. Morphological Responses of Daphnia pulex to Chaoborus americanus Kairomone in the Presence and Absence of Metals. Environ. Toxicol. Chem.23(5): 1311-1316.
Copper	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1987. Gerasimov, Y.L.. Toxic Action of Copper on Daphnia magna (Crustacea, Cladocera) at Different Feed Concentrations. Dokl. Akad. Nauk SSSR293(6): 1510-1513.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	ultiple Tissue/Orga	D	NR	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	NR		T	12.6	NA	NR	ug/L	LAB	1988. Van Leeuwen, C.J., J.L. Buchner, and H. Van Dijk. Intermittent Flow System for Population Toxicity Studies Demonstrated with Daphnia and Copper. Bull. Environ. Contam. Toxicol.40(4): 496-502.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Growth	NR		T	36.8	NA	NR	ug/L	LAB	1988. Van Leeuwen, C.J., J.L. Buchner, and H. Van Dijk. Intermittent Flow System for Population Toxicity Studies Demonstrated with Daphnia and Copper. Bull. Environ. Contam. Toxicol.40(4): 496-502.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Koivisto, S., and M. Ketola. Effects of Copper on Life-History Traits of Daphnia pulex and Bosmina longirostris. Aquat. Toxicol.32(2-3): 255-269.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Lazareva, L.P.. Changes in Biological Characteristics of Daphnia magna from Chronic Action of Copper and Nickel at Low Concentrations. Hydrobiol. J.21(5): 59-62.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Chang, C., and T.H. Sibley. Accumulation and Transfer of Copper by Oocystis pusilla. Bull. Environ. Contam. Toxicol.50(5): 689-695.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR		T	40	NA	NR	ug/L	LAB	1981. Winner, R.W.. A Comparison of Body Length, Brood Size and Longevity as Indices of Chronic Copper and Zinc Stresses in Daphnia magna. Environ. Pollut. A.26: 33-37.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR		T	60	NA	NR	ug/L	LAB	1981. Winner, R.W.. A Comparison of Body Length, Brood Size and Longevity as Indices of Chronic Copper and Zinc Stresses in Daphnia magna. Environ. Pollut. A.26: 33-37.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR		T	10	NA	NR	ug/L	LAB	1982. Flickinger, A.L., R.J.F. Bruins, R.W. Winner, and J.H. Skillings. Filtration and Phototactic Behavior as Indices of Chronic Copper Stress in Daphnia magna Straus. Arch. Environ. Contam. Toxicol.11(4): 457-463.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Koivisto, S., and M. Ketola. Effects of Copper on Life-History Traits of Daphnia pulex and Bosmina longirostris. Aquat. Toxicol.32(2-3): 255-269.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Ingersoll, C.G., and R.W. Winner. Effect on Daphnia pulex (De Geer) of Daily Pulse Exposures to Copper or Cadmium. Environ. Toxicol. Chem.1: 321-327.
Copper oxide (Cu2O)	Water Flea	Crustaceans	Fresh	Mortality	EC10	Not Reported	T	12		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC10	Not Reported	T	9		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC5	Not Reported	T	0.31		NR	uM	LAB	2006. Xie, F., S.A. Koziar, M.A. Lampi, D.G. Dixon, W.P. Norwood, U. Borgmann, X.D. Huang, and B.M. Greenberg. Assessment of the Toxicity of Mixtures of Copper, 9,10-Phenanthrenequinone, and Phenanthrene to Daphnia magna: Evidence for a Reactive Oxygen Mechanism. Environ. Toxicol. Chem.25(2): 613-622.
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	1.6		NC	ug/L	LAB	2005. Markich, S.J., G.E. Batley, J.L. Stauber, N.J. Rogers, S.C. Apte, R.V. Hyne, K.C. Bowles, K.L. Wilde, and N.M. Creighton. Hardness Corrections for Copper are Inappropriate for Protecting Sensitive Freshwater Biota. Chemosphere60: 1-8.
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	1.6		NC	ug/L	LAB	2005. Markich, S.J., G.E. Batley, J.L. Stauber, N.J. Rogers, S.C. Apte, R.V. Hyne, K.C. Bowles, K.L. Wilde, and N.M. Creighton. Hardness Corrections for Copper are Inappropriate for Protecting Sensitive Freshwater Biota. Chemosphere60: 1-8.
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	11		NC	ug/L	LAB	2005. Markich, S.J., G.E. Batley, J.L. Stauber, N.J. Rogers, S.C. Apte, R.V. Hyne, K.C. Bowles, K.L. Wilde, and N.M. Creighton. Hardness Corrections for Copper are Inappropriate for Protecting Sensitive Freshwater Biota. Chemosphere60: 1-8.
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	12		NC	ug/L	LAB	2005. Markich, S.J., G.E. Batley, J.L. Stauber, N.J. Rogers, S.C. Apte, R.V. Hyne, K.C. Bowles, K.L. Wilde, and N.M. Creighton. Hardness Corrections for Copper are Inappropriate for Protecting Sensitive Freshwater Biota. Chemosphere60: 1-8.
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	23		NC	ug/L	LAB	2005. Markich, S.J., G.E. Batley, J.L. Stauber, N.J. Rogers, S.C. Apte, R.V. Hyne, K.C. Bowles, K.L. Wilde, and N.M. Creighton. Hardness Corrections for Copper are Inappropriate for Protecting Sensitive Freshwater Biota. Chemosphere60: 1-8.
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	30		NC	ug/L	LAB	2005. Markich, S.J., G.E. Batley, J.L. Stauber, N.J. Rogers, S.C. Apte, R.V. Hyne, K.C. Bowles, K.L. Wilde, and N.M. Creighton. Hardness Corrections for Copper are Inappropriate for Protecting Sensitive Freshwater Biota. Chemosphere60: 1-8.
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	32		NC	ug/L	LAB	2005. Markich, S.J., G.E. Batley, J.L. Stauber, N.J. Rogers, S.C. Apte, R.V. Hyne, K.C. Bowles, K.L. Wilde, and N.M. Creighton. Hardness Corrections for Copper are Inappropriate for Protecting Sensitive Freshwater Biota. Chemosphere60: 1-8.
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	39		NC	ug/L	LAB	2005. Markich, S.J., G.E. Batley, J.L. Stauber, N.J. Rogers, S.C. Apte, R.V. Hyne, K.C. Bowles, K.L. Wilde, and N.M. Creighton. Hardness Corrections for Copper are Inappropriate for Protecting Sensitive Freshwater Biota. Chemosphere60: 1-8.
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	42		NC	ug/L	LAB	2005. Markich, S.J., G.E. Batley, J.L. Stauber, N.J. Rogers, S.C. Apte, R.V. Hyne, K.C. Bowles, K.L. Wilde, and N.M. Creighton. Hardness Corrections for Copper are Inappropriate for Protecting Sensitive Freshwater Biota. Chemosphere60: 1-8.
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	44		NC	ug/L	LAB	2005. Markich, S.J., G.E. Batley, J.L. Stauber, N.J. Rogers, S.C. Apte, R.V. Hyne, K.C. Bowles, K.L. Wilde, and N.M. Creighton. Hardness Corrections for Copper are Inappropriate for Protecting Sensitive Freshwater Biota. Chemosphere60: 1-8.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	9		NC	ug/L	LAB	2005. Markich, S.J., G.E. Batley, J.L. Stauber, N.J. Rogers, S.C. Apte, R.V. Hyne, K.C. Bowles, K.L. Wilde, and N.M. Creighton. Hardness Corrections for Copper are Inappropriate for Protecting Sensitive Freshwater Biota. Chemosphere60: 1-8.
Copper	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	D	1.9	NR	NR	ug/L	LAB	2005. Apte, S.C., G.E. Batley, K.C. Bowles, P.L. Brown, N. Creighton, L.T. Hales, R.V. Hyne, M. Julli, S.J. Markich, F. Pablo,. A Comparison of Copper Speciation Measurements with the Toxic Responses of Three Sensitive Freshwater Organisms. Environ. Chem.2(1): 320-330.
Copper chloride (CuCl)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	54.4		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	10.4		NC	ug/L	LAB	2003. Naddy, R.B., G.R. Stern, and R.W. Gensemer. Effect of Culture Water Hardness on the Sensitivity of Ceriodaphnia dubia to Copper Toxicity. Environ. Toxicol. Chem.22(6): 1269-1271.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	15.9		NC	ug/L	LAB	2003. Naddy, R.B., G.R. Stern, and R.W. Gensemer. Effect of Culture Water Hardness on the Sensitivity of Ceriodaphnia dubia to Copper Toxicity. Environ. Toxicol. Chem.22(6): 1269-1271.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	5.57		NC	ug/L	LAB	2003. Naddy, R.B., G.R. Stern, and R.W. Gensemer. Effect of Culture Water Hardness on the Sensitivity of Ceriodaphnia dubia to Copper Toxicity. Environ. Toxicol. Chem.22(6): 1269-1271.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	7.97		NC	ug/L	LAB	2003. Naddy, R.B., G.R. Stern, and R.W. Gensemer. Effect of Culture Water Hardness on the Sensitivity of Ceriodaphnia dubia to Copper Toxicity. Environ. Toxicol. Chem.22(6): 1269-1271.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	7.5	NR	NR	ng/d	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	70.5	NR	NR	g/g dry f	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	162		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	197		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	198		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	204		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	220		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	221		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	221		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	222		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	223		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	225		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	240		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	243		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	245		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	247		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	250		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	251		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	340		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	343		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	22	NA	NR	ug/L	LAB	1996. Sorvari, J., and M. Sillanpaa. Influence of Metal Complex Formation on Heavy Metal and Free EDTA and DTPA Acute Toxicity Determined by Daphnia magna. Chemosphere33(6): 1119-1127.
Copper oxide (Cu2O)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	42		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	1.4	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	3.7	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	27.2	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	24.5		NR	ug/L	LAB	1997. Lee, S.I., E.J. Na, Y.O. Cho, B. Koopman, and G. Bitton. Short-Term Toxicity Test Based on the Algal Uptake by Ceriodaphnia dubia. Water Environ. Res.69: 1207-1210.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	19.6	NR	NR	ug/L	LAB	1995. Bitton, G., K. Rhodes, B. Koopman, and M. Cornejo. Short-Term Toxicity Assay Based on Daphnid Feeding Behavior. Water Environ. Res.67(3): 290-293.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	3.3	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	7.6	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	4.1	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	7.4	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	11.3	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	49.5	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	A	42.93	NR	NR	ug/L	LAB	2006. Barata, C., D.J. Baird, A.J.A. Nogueira, A.M.V.M. Soares, and M.C. Riva. Toxicity of Binary Mixtures of Metals and Pyrethroid Insecticides to Daphnia magna Straus. Implications for Multi-Substance Risks Assessment. Aquat. Toxicol.78(1): 1-14.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	0.61		NR	uM	LAB	2006. Xie, F., S.A. Koziar, M.A. Lampi, D.G. Dixon, W.P. Norwood, U. Borgmann, X.D. Huang, and B.M. Greenberg. Assessment of the Toxicity of Mixtures of Copper, 9,10-Phenanthrenequinone, and Phenanthrene to Daphnia magna: Evidence for a Reactive Oxygen Mechanism. Environ. Toxicol. Chem.25(2): 613-622.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	0.96		NR	uM	LAB	2006. Xie, F., S.A. Koziar, M.A. Lampi, D.G. Dixon, W.P. Norwood, U. Borgmann, X.D. Huang, and B.M. Greenberg. Assessment of the Toxicity of Mixtures of Copper, 9,10-Phenanthrenequinone, and Phenanthrene to Daphnia magna: Evidence for a Reactive Oxygen Mechanism. Environ. Toxicol. Chem.25(2): 613-622.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	13	NR	NR	ug/L	LAB	2006. Oda, S., N. Tatarazako, H. Watanabe, M. Morita, and T. Iguchi. Genetic Differences in the Production of Male Neonates in Daphnia magna Exposed to Juvenile Hormone Analogs. Chemosphere63(9): 1477-1484.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	38	NR	NR	ug/L	LAB	2006. Oda, S., N. Tatarazako, H. Watanabe, M. Morita, and T. Iguchi. Genetic Differences in the Production of Male Neonates in Daphnia magna Exposed to Juvenile Hormone Analogs. Chemosphere63(9): 1477-1484.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	50	NR	NR	ug/L	LAB	2006. Oda, S., N. Tatarazako, H. Watanabe, M. Morita, and T. Iguchi. Genetic Differences in the Production of Male Neonates in Daphnia magna Exposed to Juvenile Hormone Analogs. Chemosphere63(9): 1477-1484.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	12.2	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	3.4	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	13		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	10	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	25	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	5	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	1	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	0.1	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	11.6	NR	NR	ug/L	LAB	2005. Tsui, M.T.K., W.X. Wang, and L.M. Chu. Influence of Glyphosate and Its Formulation (Roundup) on the Toxicity and Bioavailability of Metals to Ceriodaphnia dubia. Environ. Pollut.138(1): 59-68.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	125	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	250	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	250	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	125	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	125	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	250	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	125	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	125	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	125	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	25	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	25	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20.2		NC	ug/L	LAB	2001. Kim, S.D., M.B. Gu, H.E. Allen, and D.K. Cha. Physicochemical Factors Affecting the Sensitivity of Ceriodaphnia dubia to Copper. Environ. Monit. Assess.70(1-2): 105-116.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12		NC	ug/L	LAB	2003. Banks, K.E., S.H. Wood, C. Matthews, and K.A. Thuesen. Joint Acute Toxicity of Diazinon and Copper to Ceriodaphnia dubia. Environ. Toxicol. Chem.22(7): 1562-1567.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	56.3		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	uM	LAB	1999. Kim, S.D.. Effect of Complexation Kinetics on Bioavailability of Copper to Ceriodaphnia dubia. Ph.D.Thesis, Univ.of Delaware, Newark, DE: 202 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	uM	LAB	1999. Kim, S.D.. Effect of Complexation Kinetics on Bioavailability of Copper to Ceriodaphnia dubia. Ph.D.Thesis, Univ.of Delaware, Newark, DE: 202 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	uM	LAB	1999. Kim, S.D.. Effect of Complexation Kinetics on Bioavailability of Copper to Ceriodaphnia dubia. Ph.D.Thesis, Univ.of Delaware, Newark, DE: 202 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	649	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	119.2	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20.1	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	87.2	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	1999. Kim, S.D.. Effect of Complexation Kinetics on Bioavailability of Copper to Ceriodaphnia dubia. Ph.D.Thesis, Univ.of Delaware, Newark, DE: 202 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	192	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	56	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	76	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	84	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	91	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	93	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	406	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	104	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	127	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	25	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	27	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	34	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	42	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	49	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	63	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	71	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	78	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	79	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	81	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	95	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	327	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	302	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	302	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	249	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	119	L	23	ug/L	LAB	2007. Martin, A.J., and R. Goldblatt. Speciation, Behavior, and Bioavailability of Copper Downstream of a Mine-Impacted Lake. Environ. Toxicol. Chem.26(12): 2594-2603.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	203	L	30	ug/L	LAB	2007. Martin, A.J., and R. Goldblatt. Speciation, Behavior, and Bioavailability of Copper Downstream of a Mine-Impacted Lake. Environ. Toxicol. Chem.26(12): 2594-2603.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	96	L	20	ug/L	LAB	2007. Martin, A.J., and R. Goldblatt. Speciation, Behavior, and Bioavailability of Copper Downstream of a Mine-Impacted Lake. Environ. Toxicol. Chem.26(12): 2594-2603.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	249	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	219	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	192	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.62	L	5.65	ug/L	LAB	2008. Santos, M.A.P.F., M.G.G. Melao, and A.T. Lombardi. The Effects of Humic Substances on Copper Toxicity to Ceriodaphnia silvestrii Daday (Crustacea, Cladocera). Ecotoxicology17(6): 449-454.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	83	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67.2	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	54.6	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.4	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	21	NA	NR	ug/L	LAB	1988. Wakabayashi, M., R. Konno, and T. Nishiido. Relative Lethal Sensitivity of Two Daphnia Species to Chemicals. Tokyo-to Kankyo Kagaku Kenkyusho Nenpo: 126-128.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	9.4	NA	NR	ug/L	LAB	1988. Wakabayashi, M., R. Konno, and T. Nishiido. Relative Lethal Sensitivity of Two Daphnia Species to Chemicals. Tokyo-to Kankyo Kagaku Kenkyusho Nenpo: 126-128.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NR	NR	ug/L	LAB	2000. De la Torre, A.I., J.A. Jimqnez, M. Carballo, C. Fernandez, J. Roset, and M.J. Munoz. Ecotoxicological Evaluation of Pig Slurry. Chemosphere41(10): 1629-1635.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30.9	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	39	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	39.1	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	41	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	48	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50.4	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	51	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	59	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	63	NR	NR	ug/L	LAB	1993. Lazorchak, J.M., and W.T. Waller. The Relationship of Total Copper 48-H LC50s to Daphnia magna dry Weight. Environ. Toxicol. Chem.12: 903-911.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24	D	19	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26	D	19	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28	D	24	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29	D	23	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	D	26	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32	D	25	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35	D	33	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36	D	32	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37	D	36	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37	D	24	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38	D	27	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	39	D	34	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	44	D	36	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46	D	40	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	49	D	44	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50	D	41	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	51	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	53	D	46	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	59	D	37	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	63	D	46	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	96	D	84	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	101	D	90	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26	D	21	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26	D	21	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29	D	22	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30.9	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31	D	28	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	D	26	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	D	27	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	39.1	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	D	27	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	41	D	28	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	48	D	39	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50.4	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	51	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	56	D	47	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	59	D	51	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	65	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	54	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	82	NR	NR	ug/L	LAB	1975. Winner, R.. Food Type Related to Copper Sensitivity of Daphnids. In: Int.Conf.on Heavy Metals in the Environment, Abstracts, Institute for Environmental Studies, University of Toronto, Ontario, Canada: C295 - C297.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	84	NR	NR	ug/L	LAB	1975. Winner, R.. Food Type Related to Copper Sensitivity of Daphnids. In: Int.Conf.on Heavy Metals in the Environment, Abstracts, Institute for Environmental Studies, University of Toronto, Ontario, Canada: C295 - C297.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52	NA	NR	ug/L	LAB	1987. Lazorchak, J.M.. The Significance of Weight Loss of Daphnia magna Straus During Acute Toxicity Tests with Copper. Ph.D Thesis, Univ.of Texas, Dallas, TX: 191 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	2.3	NA	NR	ug/L	LAB	1988. Wakabayashi, M., R. Konno, and T. Nishiido. Relative Lethal Sensitivity of Two Daphnia Species to Chemicals. Tokyo-to Kankyo Kagaku Kenkyusho Nenpo: 126-128.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	1.3	NA	NR	ug/L	LAB	1988. Wakabayashi, M., R. Konno, and T. Nishiido. Relative Lethal Sensitivity of Two Daphnia Species to Chemicals. Tokyo-to Kankyo Kagaku Kenkyusho Nenpo: 126-128.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	37	NR	NR	ug/L	LAB	1994. Dobbs, M.G., J.L. Farris, R.J. Reash, D.S. Cherry, and J.,Jr. Cairns. Evaluation of the Resident-Species Procedure for Developing Site-Specific Water Quality Criteria for Copper in Blaine Creek, Kentucky. Environ. Toxicol. Chem.13(6): 963-971.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	53	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	57	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.1	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.58	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.08	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.58	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	142	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	64	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	91	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	95	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	191	NR	NR	ug/L	LAB	2006. Dekker, T., G.D. Greve, T.L. Ter Laak, M.E. Boivin, B. Veuger, G. Gortzak, S. Dumfries, S.M.G. Lucker, M.H.S. Kraak, W.. Development and Application of a Sediment Toxicity Test Using the Benthic Cladoceran Chydorus sphaericus. Environ. Pollut.140(2): 231-238.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	121	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	138	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	76	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	97	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride (CuCl)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	419		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Copper chloride (CuCl)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	580		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	60		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Copper chloride (CuCl)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	9		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Copper chloride (CuCl)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	710		NC	ug/L	LAB	2007. Nandini, S., E.A. Picazo-Paez, and S.S.S. Sarma. The Combined Effects of Heavy Metals (Copper and Zinc), Temperature and Food (Chlorella vulgaris) Level on the Demographic Characters of Moina macrocopa (Crustacea: Cladocera). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control42(10): 1433-1442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	2.387		NC	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	90.44		NC	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.5		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12.94		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14.49		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16.16		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17.47		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.88		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.89		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.92		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.14		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.9133	T	2.413	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	102.5	T	120.2	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	110.3	T	135.8	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	2.092	T	4.778	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	2.221	T	2.43	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	2.2501	T	2.743	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	2.64	T	3.06	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	3.274	T	2.454	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	50.46	T	64.84	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	60.92	T	70.97	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	78.7	T	88.04	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	95.55	T	122.4	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.8478	T	2.274	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1.505		NR	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1.892	T	4.503	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	100.9	T	124	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	102.5	T	120.2	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	2.139	T	2.663	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	2.21	T	2.276	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	3.087	T	2.282	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	49.59	T	63.81	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	59.77	T	69.58	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	61.18		NR	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	71.34	T	79.78	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16.1	NR	NR	ug/L	LAB	2003. Hunt, J.W., B.S. Anderson, B.M. Phillips, P.N. Nicely, R.S. Tjeerdema, H.M. Puckett, M. Stephenson, K. Worcester, and V.. Ambient Toxicity due to Chlorpyrifos and Diazinon in a Central California Coastal Watershed. Environ. Monit. Assess.82: 83-112.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.5	NR	NR	ng/d	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70.5	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1974. Baudouin, M.F., and P. Scoppa. Acute Toxicity of Various Metals to Freshwater Zooplankton. Bull. Environ. Contam. Toxicol.12(6): 745-751.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.99		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12.2		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16.35		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16.93		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20.97		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21.55		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31.77		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	42.68		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	57.28		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	357	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	398	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	421	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	426	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	466	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38	NA	NR	ug/L	LAB	1985. Blaylock, B.G., M.L. Frank, and J.F. McCarthy. Comparative Toxicity of Copper and Acridine to Fish, Daphnia and Algae. Environ. Toxicol. Chem.4(1): 63-71.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	96	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	322	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	335	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	347	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	354	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	369	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	398	NR	NR	nM	LAB	2006. Canli, M.. Effects of Copper Pre-Exposure Routes on the Energy Reserves and Subsequent Copper Toxicity in Daphnia magna. Environ. Toxicol.21(5): 521-527.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	299	D	30	ug/L	LAB	1984. Cairns, M.A., A.V. Nebeker, J.H. Gakstatter, and W.L. Griffis. Toxicity of Copper-Spiked Sediments to Freshwater Invertebrates. Environ. Toxicol. Chem.3(3): 435-445.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	69	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	77	NA	NR	ug/L	LAB	1984. Cairns, M.A., A.V. Nebeker, J.H. Gakstatter, and W.L. Griffis. Toxicity of Copper-Spiked Sediments to Freshwater Invertebrates. Environ. Toxicol. Chem.3(3): 435-445.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1972. Adema, D.M.M., and A.M. Degroot-Van Zijl. The Influence of Copper on the Water Flea Daphnia magna (De Invloed van Koper op de Watervlo Daphnia magna). TNO Nieuws27(9): 474-482.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	65	NA	NR	ug/L	LAB	1972. Adema, D.M.M., and A.M. Degroot-Van Zijl. The Influence of Copper on the Water Flea Daphnia magna (De Invloed van Koper op de Watervlo Daphnia magna). TNO Nieuws27(9): 474-482.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	69	NA	NR	ug/L	LAB	1988. Van Leeuwen, C.J., J.L. Buchner, and H. Van Dijk. Intermittent Flow System for Population Toxicity Studies Demonstrated with Daphnia and Copper. Bull. Environ. Contam. Toxicol.40(4): 496-502.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1985. Blaylock, B.G., M.L. Frank, and J.F. McCarthy. Comparative Toxicity of Copper and Acridine to Fish, Daphnia and Algae. Environ. Toxicol. Chem.4(1): 63-71.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	25	NA	NR	ug/L	LAB	1972. Adema, D.M.M., and A.M. Degroot-Van Zijl. The Influence of Copper on the Water Flea Daphnia magna (De Invloed van Koper op de Watervlo Daphnia magna). TNO Nieuws27(9): 474-482.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1972. Adema, D.M.M., and A.M. Degroot-Van Zijl. The Influence of Copper on the Water Flea Daphnia magna (De Invloed van Koper op de Watervlo Daphnia magna). TNO Nieuws27(9): 474-482.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1993. Roux, D.J., P.L. Kempster, E. Truter, and L. Van der Merwe. Effect of Cadmium and Copper on Survival and Reproduction of Daphnia pulex. Water SA19(4): 269-274.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	22	NA	NR	ug/L	LAB	1993. Roux, D.J., P.L. Kempster, E. Truter, and L. Van der Merwe. Effect of Cadmium and Copper on Survival and Reproduction of Daphnia pulex. Water SA19(4): 269-274.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24	NA	NR	ug/L	LAB	1993. Roux, D.J., P.L. Kempster, E. Truter, and L. Van der Merwe. Effect of Cadmium and Copper on Survival and Reproduction of Daphnia pulex. Water SA19(4): 269-274.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Roux, D.J., P.L. Kempster, E. Truter, and L. Van der Merwe. Effect of Cadmium and Copper on Survival and Reproduction of Daphnia pulex. Water SA19(4): 269-274.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	10.4	NR	NR	ug/L	LAB	1999. Lytle, R.D.. In Situ Copper Toxicity Tests: Applying Likelihood Ratio Tests to Daphnia pulex Incubations in Keweenaw Peninsula Waters. J. Great Lakes Res.25(4): 744-759.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.42	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.06	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12.74	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12.84	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19.67	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.87	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5.93	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.24	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.49	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.09	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.84	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.73	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5.51	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.03	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.09	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12.61	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.92	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.09	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.3	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.06	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.48	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Nitric acid, Copper(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Nitric acid, Copper(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	444	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	304	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	305	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	341	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.5	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	286	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	208	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	138	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	129	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	112	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	53	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	92	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	97	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0		NC	M	LAB	2002. Kim, S.D.. Determination of Copper Binding Affinity of Ceriodaphnia dubia Using Competition Bioassay Tests: Environmental Significance. Bull. Environ. Contam. Toxicol.68(2): 245-252.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.16		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.5		NC	ug/L	LAB	2004. El-Merhibi, A., A. Kumar, and T. Smeaton. Role of Piperonyl Butoxide in the Toxicity of Chlorpyrifos to Ceriodaphnia dubia and Xenopus laevis. Ecotoxicol. Environ. Saf.57(2): 202-212.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.34	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17.14	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19.83	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19.6	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	117.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.18	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.56	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	117.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.18	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.56	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.98	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	103	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.34	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.7	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12.3	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15.39	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16.24	NR	NR	ug/L	LAB	2001. Black, M.C.. Water Quality Standards for North Carolina's Endangered Mussels. Final Report, Dept.of Env.Health Sciences, Univ.of Georgia, Athens, GA: 34 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19.1	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23.1	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24.2	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33.5	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36.4	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36.6	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46.6	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	53.2	NR	NR	ug/L	LAB	1995. Bright, G.R.. Variability of the "Water Effect Ratio" for Copper Toxicity - a Case Study. Proc.Toxic Subst.Water Environ., May 23-30, Water Environ.Fed., Alexandria, VA: 5.23 - 5.30.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2004. Henry, T.B., J.W. Kwon, K.L. Armbrust, and M.C. Black. Acute and Chronic Toxicity of Five Selective Serotonin Reuptake Inhibitors in Ceriodaphnia dubia. Environ. Toxicol. Chem.23(9): 2229-2233.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	24000	NA	NR	ug/L	LAB	1995. Kubitz, J.A., E.C. Lewek, J.M. Besser, J.B. Drake III, and J.P. Giesy. Effects of Copper-Contaminated Sediments on Hyalella azteca, Daphnia magna, and Ceriodaphnia dubia: Survival, Growth, and Enzyme Inhibition. Arch. Environ. Contam. Toxicol.29(1): 97-103.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13.4	NA	NR	ug/L	LAB	1991. Oris, J.T., R.W. Winner, and M.V. Moore. A Four-Day Survival and Reproduction Toxicity Test for Ceriodaphnia dubia. Environ. Toxicol. Chem.10(2): 217-224.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.72	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.23	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	84	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18.3	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.46	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	121.7	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.06	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	42	NR	NR	ug/L	LAB	2008. Johnson, B.M., M.M. Chao, O.R. Tedrow, A.D. McQueen, and J.H.,Jr. Rodgers. Responses of Lepomis macrochirus, Pimephales promelas, Hyalella azteca, Ceriodaphnia dubia, and Daphnia magna to Exposures of Algimycin PWF and Copper Sulfate Pentahydrate. J. Aquat. Plant Manage.46: 176-183.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.8	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.8	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	39	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	39.6	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46.3	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46.9	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.5	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.5	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.16	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	117.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.56	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	340		NC	ug/L	LAB	2007. Mohammed, A.. Comparative Sensitivities of the Tropical Cladoceran, Ceriodaphnia rigaudii and the Temperate Species Daphnia magna to Seven Toxicants. Toxicol. Environ. Chem.89(2): 347-352.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	340	NR	NR	ug/L	LAB	2006. Mohammed, A., and J.B.R. Agard. Comparative Sensitivity of Three Tropical Cladoceran Species (Diaphanosoma brachyurum, Ceriodaphnia rigaudii and Moinodaphnia macleayi) to Six Chemicals. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control41(12): 2713-2720.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.53		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37.3	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	105	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	113	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	115	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	119	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	126	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	148	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	151	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	169	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	175	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	175	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	179	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	181	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	182	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	182	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	226	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29.3	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38.9	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60.7	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	62.6	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70.9	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	75.8	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	79.3	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80.7	NR	NR	ug/L	LAB	2007. Martins, N., I. Lopes, R.M. Harper, P. Ross, and R. Ribeiro. Differential Resistance to Copper and Mine Drainage in Daphnia longispina: Relationship with Allozyme Genotypes. Environ. Toxicol. Chem.26(9): 1904-1909.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	62		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.4		NC	ug/L	LAB	2001. Knops, M., R. Altenburger, and H. Segner. Alterations of Physiological Energetics, Growth and Reproduction of Daphnia magna Under Toxicant Stress. Aquat. Toxicol.53(2): 79-90.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10		NC	ug/L	LAB	2004. Long, K.E., E.J. Van Genderen, and S.J. Klaine. The Effects of Low Hardness and pH on Copper Toxicity to Daphnia magna - Short Communication. Environ. Toxicol. Chem.23(1): 72-75.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.1		NC	ug/L	LAB	2004. Long, K.E., E.J. Van Genderen, and S.J. Klaine. The Effects of Low Hardness and pH on Copper Toxicity to Daphnia magna - Short Communication. Environ. Toxicol. Chem.23(1): 72-75.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2		NC	ug/L	LAB	2004. Long, K.E., E.J. Van Genderen, and S.J. Klaine. The Effects of Low Hardness and pH on Copper Toxicity to Daphnia magna - Short Communication. Environ. Toxicol. Chem.23(1): 72-75.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2		NC	ug/L	LAB	2004. Long, K.E., E.J. Van Genderen, and S.J. Klaine. The Effects of Low Hardness and pH on Copper Toxicity to Daphnia magna - Short Communication. Environ. Toxicol. Chem.23(1): 72-75.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2		NC	ug/L	LAB	2004. Long, K.E., E.J. Van Genderen, and S.J. Klaine. The Effects of Low Hardness and pH on Copper Toxicity to Daphnia magna - Short Communication. Environ. Toxicol. Chem.23(1): 72-75.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2		NC	ug/L	LAB	2004. Long, K.E., E.J. Van Genderen, and S.J. Klaine. The Effects of Low Hardness and pH on Copper Toxicity to Daphnia magna - Short Communication. Environ. Toxicol. Chem.23(1): 72-75.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.8		NC	ug/L	LAB	2004. Long, K.E., E.J. Van Genderen, and S.J. Klaine. The Effects of Low Hardness and pH on Copper Toxicity to Daphnia magna - Short Communication. Environ. Toxicol. Chem.23(1): 72-75.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.8		NC	ug/L	LAB	2004. Long, K.E., E.J. Van Genderen, and S.J. Klaine. The Effects of Low Hardness and pH on Copper Toxicity to Daphnia magna - Short Communication. Environ. Toxicol. Chem.23(1): 72-75.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.5		NC	ug/L	LAB	2004. Long, K.E., E.J. Van Genderen, and S.J. Klaine. The Effects of Low Hardness and pH on Copper Toxicity to Daphnia magna - Short Communication. Environ. Toxicol. Chem.23(1): 72-75.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.4		NC	ug/L	LAB	2004. Long, K.E., E.J. Van Genderen, and S.J. Klaine. The Effects of Low Hardness and pH on Copper Toxicity to Daphnia magna - Short Communication. Environ. Toxicol. Chem.23(1): 72-75.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	280		NC	ug/L	LAB	2007. Mohammed, A.. Comparative Sensitivities of the Tropical Cladoceran, Ceriodaphnia rigaudii and the Temperate Species Daphnia magna to Seven Toxicants. Toxicol. Environ. Chem.89(2): 347-352.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18.9		NC	ug/L	LAB	2000. Mastin, B.J., and J.H.,Jr. Rodgers. Toxicity and Bioavailability of Copper Herbicides (Clearigate, Cutrine-Plus, and Copper Sulfate) to Freshwater Animals. Arch. Environ. Contam. Toxicol.39(4): 445-451.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24.93		NC	ug/L	LAB	2002. McWilliam, R.A., and D.J. Baird. Postexposure Feeding Depression: A new Toxicity Endpoint for Use in Laboratory Studies with Daphnia magna. Environ. Toxicol. Chem.21(6): 1198-1205.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	58.77		NC	ug/L	LAB	2002. McWilliam, R.A., and D.J. Baird. Postexposure Feeding Depression: A new Toxicity Endpoint for Use in Laboratory Studies with Daphnia magna. Environ. Toxicol. Chem.21(6): 1198-1205.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	399	NR	NR	ug/L	LAB	2000. Guilhermino, L., T. Diamantino, M.C. Silva, and A.M.V.M. Soares. Acute Toxicity Test with Daphnia magna: An Alternative to Mammals in the Prescreening of Chemical Toxicity?. Ecotoxicol. Environ. Saf.46(3): 357-362.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	125	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	536	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Preventive Effects of Amino Acids on the Toxicity of Copper to Daphnia magna. Water Air Soil Pollut.32(3-4): 379-387.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	580	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35.7	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.62	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.5	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.9	NA	NR	ug/L	LAB	1984. Dave, G.. Effects of Copper on Growth, Reproduction, Survival and Haemoglobin in Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.78(2): 439-443.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35.2	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.43	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.5	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1981. Bishop, W.E., and R.L. Perry. Development and Evaluation of a Flow-Through Growth Inhibition Test with Duckweed (Lemna minor). In: D.R.Branson and K.L.Dickson (Eds.), Aquatic Toxicology and Hazard Assessment, 4th Conf., ASTM STP 737, Philadelphia, PA: 421-435.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	0.01	T	67.8	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	0.013	T	39.7	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	0.016	T	18.9	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	0.023	T	57.2	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	0.03	T	18.7	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	0.036	T	39.9	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	0.053	T	16.4	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	0.055	T	46	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	0.057	T	71.9	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	NR	NR	NR	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	NR	NR	NR	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	NR	NR	NR	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	NR	NR	NR	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	NR	NR	NR	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	NR	NR	NR	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.1	NR	NR	ug/L	LAB	1991. Meador, J.P.. The Interaction of pH, Dissolved Organic Carbon, and Total Copper in the Determination of Ionic Copper and Toxicity. Aquat. Toxicol.19(1): 13-31.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20	NR	NR	ug/L	LAB	1999. Sankaramanachi, S.K., and S.R. Qasim. Metal Toxicity Evaluation Using Bioassay and Microtox. Int. J. Environ. Stud.56(2): 187-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	37.9	NR	NR	ug/L	LAB	2005. Barata, C., I. Varo, J.C. Navarro, S. Arun, and C. Porte. Antioxidant Enzyme Activities and Lipid Peroxidation in the Freshwater Cladoceran Daphnia magna Exposed to Redox Cycling Compounds. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.140(2): 175-186.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	82.6	NR	NR	ug/L	LAB	2000. Guilhermino, L., T. Diamantino, M.C. Silva, and A.M.V.M. Soares. Acute Toxicity Test with Daphnia magna: An Alternative to Mammals in the Prescreening of Chemical Toxicity?. Ecotoxicol. Environ. Saf.46(3): 357-362.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	82	NA	NR	ug/L	LAB	1996. Hayes, K.R., W.S. Douglas, and J. Fischer. Inter- and Intra-Laboratory Testing of the Daphnia magna IQ Toxicity Test. Bull. Environ. Contam. Toxicol.57(4): 660-666.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	171	NR	NR	ug/L	LAB	2000. Barata, C., D.J. Baird, A. Minarro, and A.M.V.M. Soares. Do Genotype Responses Always Converge from Lethal to Nonlethal Toxicant Exposure Levels? Hypothesis Tested Using Clones of Daphnia magna Straus. Environ. Toxicol. Chem.19(9): 2314-2322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38	NR	NR	ug/L	LAB	2000. Barata, C., D.J. Baird, A. Minarro, and A.M.V.M. Soares. Do Genotype Responses Always Converge from Lethal to Nonlethal Toxicant Exposure Levels? Hypothesis Tested Using Clones of Daphnia magna Straus. Environ. Toxicol. Chem.19(9): 2314-2322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Barata, C., D.J. Baird, A. Minarro, and A.M.V.M. Soares. Do Genotype Responses Always Converge from Lethal to Nonlethal Toxicant Exposure Levels? Hypothesis Tested Using Clones of Daphnia magna Straus. Environ. Toxicol. Chem.19(9): 2314-2322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Barata, C., D.J. Baird, A. Minarro, and A.M.V.M. Soares. Do Genotype Responses Always Converge from Lethal to Nonlethal Toxicant Exposure Levels? Hypothesis Tested Using Clones of Daphnia magna Straus. Environ. Toxicol. Chem.19(9): 2314-2322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.00115	NA	NR	mmol/L	LAB	1995. Arambasic, M.B., S. Bjelic, and G. Subakov. Acute Toxicity of Heavy Metals (Copper, Lead, Zinc), Phenol and Sodium on Allium cepa L.., Lepidium sativum L. and Daphnia magna St.: Comparative Investigations and the Practical Applications. Water Res.29(2): 497-503.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	44	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18.5	NA	NR	ug/L	LAB	1984. Dave, G.. Effects of Copper on Growth, Reproduction, Survival and Haemoglobin in Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.78(2): 439-443.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.03	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.04	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.04	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.05	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.07	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.08	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.09	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.1	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.11	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.13	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.14	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.15	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.17	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.17	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.17	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.18	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.19	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.23	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.23	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.29	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.31	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.37	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.4	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.42	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.43	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.47	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.5	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.5	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.6	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.61	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	0.77	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1.6	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	106.4	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	108.8	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	122.5	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	130.5	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	15.3	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	159	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	16.7	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	18	NR	NR	ug/L	LAB	2000. Long, K.E.. The Effect of Low Hardness and pH on Copper Toxicity to Daphnia magna. M.S.Thesis, Clemson Univ., Clemson, SC: 75 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	18.8	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	187.6	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	2.6	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	21.1	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	22.8	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	25.2	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	25.9	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	26.6	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	3.2	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	30.8	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	38.2	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	4	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	4.9	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	45.1	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	47.3	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	5.2	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	7	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	8.3	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	8.6	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	9.3	NR	NR	ug/L	LAB	2009. Ryan, A.C., J.R. Tomasso, and S.J. Klaine. Influence of pH, Hardness, Dissolved Organic Carbon Concentration, and Dissolved Organic Matter Source on the Acute Toxicity of Copper to Daphnia magna in Soft Waters: Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.28(8): 1663-1670.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	119	L	3.5	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15.4	L	1.6	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NR	NR	ug/L	LAB	2006. Kim, K.T., Y.G. Lee, and S.D. Kim. Combined Toxicity of Copper and Phenol Derivatives to Daphnia magna: Effect of Complexation Reaction. Environ. Int.32(4): 487-492.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23.1	L	0.7	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.2	L	0.3	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	22000	NA	NR	ug/L	LAB	1995. Kubitz, J.A., E.C. Lewek, J.M. Besser, J.B. Drake III, and J.P. Giesy. Effects of Copper-Contaminated Sediments on Hyalella azteca, Daphnia magna, and Ceriodaphnia dubia: Survival, Growth, and Enzyme Inhibition. Arch. Environ. Contam. Toxicol.29(1): 97-103.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.3	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.25	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	12	NR	NR	ug/L	LAB	2006. Yim, J.H., K.W. Kim, and S.D. Kim. Effect of Hardness on Acute Toxicity of Metal Mixtures Using Daphnia magna: Prediction of Acid Mine Drainage Toxicity. J. Hazard. Mater.B138(1): 16-21.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	4	NR	NR	ug/L	LAB	2006. Yim, J.H., K.W. Kim, and S.D. Kim. Effect of Hardness on Acute Toxicity of Metal Mixtures Using Daphnia magna: Prediction of Acid Mine Drainage Toxicity. J. Hazard. Mater.B138(1): 16-21.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.53	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.32	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	27	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	27	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.9*	NA	NR	ug/L	LAB	1986. Ziegenfuss, P.S., W.J. Renaudette, and W.J. Adams. Methodology for Assessing the Acute Toxicity of Chemicals Sorbed to Sediments: Testing the Equilibrium Partitioning Theory. In: T.M.Poston and R.Purdy (Eds.), Aquatic Toxicology and Environmental Fate, 9th Volume, ASTM STP 921, Philadelphia, PA: 479-493.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5*	NA	NR	ug/L	LAB	1982. Qureshi, A.A., K.W. Flood, S.R. Thompson, S.M. Janhurst, C.S. Inniss, and D.A. Rokosh. Comparison of a Luminescent Bacterial Test with Other Bioassays for Determining Toxicity of Pure Compounds and Complex Effluents. In: J.G.Pearson, R.B.Foster and W.E.Bishop (Eds.), Aquatic Toxicology and Hazard Assessment, 5th Confrence, ASTM STP 766, Philadelphia, PA: 179-195.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1992. Oikari, A., J. Kukkonen, and V. Virtanen. Acute Toxicity of Chemicals to Daphnia magna in Humic Waters. Sci. Total Environ.117-118: 367-377.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	93	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Preventive Effects of Amino Acids on the Toxicity of Copper to Daphnia magna. Water Air Soil Pollut.32(3-4): 379-387.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.4	NA	NR	ug/L	LAB	1984. Dave, G.. Effects of Copper on Growth, Reproduction, Survival and Haemoglobin in Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.78(2): 439-443.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.25	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.3	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	56.6	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60.9	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	61.4	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	62.9	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	64.1	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	64.5	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66.5	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66.8	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66.9	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67.6	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	68.7	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70.1	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	75	NA	NR	ug/L	LAB	1975. Debelak, R.W.. Acute Toxicity of Mixtures of Copper, Chromium and Cadmium to Daphnia magna. M.S.Thesis, Miami University, Oxford, OH: 54 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	81.4	NA	NR	ug/L	LAB	1977. Winner, R.W., T. Keeling, R. Yeager, and M.P. Farrell. Effect of Food Type on the Acute and Chronic Toxicity of Copper to Daphnia magna. Freshw. Biol.7(4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	81.5	NA	NR	ug/L	LAB	1977. Winner, R.W., T. Keeling, R. Yeager, and M.P. Farrell. Effect of Food Type on the Acute and Chronic Toxicity of Copper to Daphnia magna. Freshw. Biol.7(4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	85	NA	NR	ug/L	LAB	1977. Winner, R.W., T. Keeling, R. Yeager, and M.P. Farrell. Effect of Food Type on the Acute and Chronic Toxicity of Copper to Daphnia magna. Freshw. Biol.7(4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	85.3	NA	NR	ug/L	LAB	1977. Winner, R.W., T. Keeling, R. Yeager, and M.P. Farrell. Effect of Food Type on the Acute and Chronic Toxicity of Copper to Daphnia magna. Freshw. Biol.7(4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	88.8	NA	NR	ug/L	LAB	1977. Winner, R.W., T. Keeling, R. Yeager, and M.P. Farrell. Effect of Food Type on the Acute and Chronic Toxicity of Copper to Daphnia magna. Freshw. Biol.7(4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Flickinger, A.L., R.J.F. Bruins, R.W. Winner, and J.H. Skillings. Filtration and Phototactic Behavior as Indices of Chronic Copper Stress in Daphnia magna Straus. Arch. Environ. Contam. Toxicol.11(4): 457-463.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.1	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36.8	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.96	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5	NR	NR	ug/L	LAB	2008. Johnson, B.M., M.M. Chao, O.R. Tedrow, A.D. McQueen, and J.H.,Jr. Rodgers. Responses of Lepomis macrochirus, Pimephales promelas, Hyalella azteca, Ceriodaphnia dubia, and Daphnia magna to Exposures of Algimycin PWF and Copper Sulfate Pentahydrate. J. Aquat. Plant Manage.46: 176-183.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.3	NA	NR	umol/L	LAB	1993. Meador, J.P., F.B. Taub, and T.H. Sibley. Copper Dynamics and the Mechanism of Ecosystem Level Recovery in a Standardized Aquatic Microcosm. Ecol. Appl.3(1): 139-155.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	1985. Preshing, M.. Effect of Certain Toxicants on the Survival Rate of Daphnia magna in a Three-Factor Experiment. Hydrobiol. J.21: 1-4.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.7	NA	NR	ug/L	LAB	1984. Dave, G.. Effects of Copper on Growth, Reproduction, Survival and Haemoglobin in Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.78(2): 439-443.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.6	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.68	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1992. Ferrando, M.D., E. Andreu-Moliner, and A. Fernandez-Casalderrey. Relative Sensitivity of Daphnia magna and Brachionus calyciflorus to Five Pesticides. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes27(5): 511-522.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	82.362	NA	NR	ug/L	LAB	1990. Jindal, R., and A. Verma. Heavy Metal Toxicity to Daphnia pulex. Indian J. Environ. Health32(3): 289-292.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	56	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17.1	NA	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23	NA	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23.3	NA	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26.4	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	27.2	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28.8	NA	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30.5	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	31.4	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32.7	NA	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	39.3	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40.3	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	45	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	45.6	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50.3	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52.8	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	63.4	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	64	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	66.2	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	71.2	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23.3	NA	NR	ug/L	LAB	1984. Winner, R.W.. The Toxicity and Bioaccumulation of Cadmium and Copper as Affected by Humic Acid. Aquat. Toxicol.5(3): 267-274.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28.8	NA	NR	ug/L	LAB	1984. Winner, R.W.. The Toxicity and Bioaccumulation of Cadmium and Copper as Affected by Humic Acid. Aquat. Toxicol.5(3): 267-274.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32.7	NA	NR	ug/L	LAB	1984. Winner, R.W.. The Toxicity and Bioaccumulation of Cadmium and Copper as Affected by Humic Acid. Aquat. Toxicol.5(3): 267-274.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28	NA	NR	ug/L	LAB	1974. McIntosh, A.W., and N.R. Kevern. Toxicity of Copper to Zooplankton. J. Environ. Qual.3(2): 166-170.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	28	NA	NR	ug/L	LAB	1974. McIntosh, A.W., and N.R. Kevern. Toxicity of Copper to Zooplankton. J. Environ. Qual.3(2): 166-170.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10.8	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.4	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	113	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	165	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	184	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	199	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	213	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35.5	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	53.3	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	55.3	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	55.4	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	627	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.24	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	76.4	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	78.8	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	84.7	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.06	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.3	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	97.2	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.1	NA	NR	ug/L	LAB	1990. Soundrapandian, S., and K. Venkataraman. Effect of Heavy Metal Salts on the Life History of Daphnia similis Claus (Crustacea: Cladocera). Proc. Indian Acad. Sci. Anim. Sci.99(5): 411-418.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.1	NA	NR	ug/L	LAB	1990. Soundrapandian, S., and K. Venkataraman. Effect of Heavy Metal Salts on the Life History of Daphnia similis Claus (Crustacea: Cladocera). Proc. Indian Acad. Sci. Anim. Sci.99(5): 411-418.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	950	NR	NR	ug/L	LAB	2006. Mohammed, A., and J.B.R. Agard. Comparative Sensitivity of Three Tropical Cladoceran Species (Diaphanosoma brachyurum, Ceriodaphnia rigaudii and Moinodaphnia macleayi) to Six Chemicals. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control41(12): 2713-2720.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	1992. Wong, C.K.. Effects of Chromium, Copper, Nickel, and Zinc on Survival and Feeding of the Cladoceran Moina macrocopa. Bull. Environ. Contam. Toxicol.49: 593-599.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	1992. Wong, C.K.. Effects of Chromium, Copper, Nickel, and Zinc on Survival and Feeding of the Cladoceran Moina macrocopa. Bull. Environ. Contam. Toxicol.49: 593-599.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5.9	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.45	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26		NC	ug/L	LAB	2002. Orchard, S.J., D.A. Holdway, C. Barata, and R.A. Van Dam. A Rapid Response Toxicity Test Based on the Feeding Rate of the Tropical Cladoceran Moinodaphnia macleayi. Ecotoxicol. Environ. Saf.53(1): 12-19.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	NR	NR	ug/L	LAB	2006. Mohammed, A., and J.B.R. Agard. Comparative Sensitivity of Three Tropical Cladoceran Species (Diaphanosoma brachyurum, Ceriodaphnia rigaudii and Moinodaphnia macleayi) to Six Chemicals. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control41(12): 2713-2720.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	125	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	0.25	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	9.3	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	500	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	200	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	140	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	97	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	67	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	25	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	0.1	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	0.1	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	250	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	25	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	25	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	270	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	125	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	0.25	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	9.3	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	37	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	6	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1975. Winner, R.. Food Type Related to Copper Sensitivity of Daphnids. In: Int.Conf.on Heavy Metals in the Environment, Abstracts, Institute for Environmental Studies, University of Toronto, Ontario, Canada: C295 - C297.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	60	NR	NR	ug/L	LAB	1975. Winner, R.. Food Type Related to Copper Sensitivity of Daphnids. In: Int.Conf.on Heavy Metals in the Environment, Abstracts, Institute for Environmental Studies, University of Toronto, Ontario, Canada: C295 - C297.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	15	NR	NR	ug/L	LAB	2002. Semsari, S., H.A. Amar, Z. Badani, and B. Benayad. Study of the Inhibition of Certain Trophic Levels by the Presence of Metal Cations in Water. Desalination150(2): 177-188.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper chloride (CuCl)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	20		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	200	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	14	NR	NR	ug/L	LAB	2008. Johnson, B.M., M.M. Chao, O.R. Tedrow, A.D. McQueen, and J.H.,Jr. Rodgers. Responses of Lepomis macrochirus, Pimephales promelas, Hyalella azteca, Ceriodaphnia dubia, and Daphnia magna to Exposures of Algimycin PWF and Copper Sulfate Pentahydrate. J. Aquat. Plant Manage.46: 176-183.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	50	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	30	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	30	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	50	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	10.6	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	60000	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	60000	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	600000	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	600000	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	60	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	600	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	1	NR	NR	ug/L	LAB	2008. Johnson, B.M., M.M. Chao, O.R. Tedrow, A.D. McQueen, and J.H.,Jr. Rodgers. Responses of Lepomis macrochirus, Pimephales promelas, Hyalella azteca, Ceriodaphnia dubia, and Daphnia magna to Exposures of Algimycin PWF and Copper Sulfate Pentahydrate. J. Aquat. Plant Manage.46: 176-183.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	74.7	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	120	NR	NR	ug/L	LAB	2001. Atienzar, F.A., V.V. Cheung, A.N. Jha, and M.H. Depledge. Fitness Parameters and DNA Effects are Sensitive Indicators of Copper-Induced Toxicity in Daphnia magna. Toxicol. Sci.59(2): 241-250.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	27		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	20		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	5		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	33		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	16	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	8	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	16	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	32	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	32	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	48	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	48	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	180	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	19	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	4	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	40	NR	NR	ug/L	LAB	1975. Winner, R.. Food Type Related to Copper Sensitivity of Daphnids. In: Int.Conf.on Heavy Metals in the Environment, Abstracts, Institute for Environmental Studies, University of Toronto, Ontario, Canada: C295 - C297.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2005. Milam, C.D., J.L. Farris, F.J. Dwyer, and D.K. Hardesty. Acute Toxicity of Six Freshwater Mussel Species (Glochidia) to Six Chemicals: Implications for Daphnids and Utterbackia imbecillis as Surrogates for Protection of Freshwater Mussels (Unionidae). Arch. Environ. Contam. Toxicol.48(2): 166-173.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	2	NR	NR	ug/L	LAB	2002. Semsari, S., H.A. Amar, Z. Badani, and B. Benayad. Study of the Inhibition of Certain Trophic Levels by the Presence of Metal Cations in Water. Desalination150(2): 177-188.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper chloride (CuCl)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	10		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	3.7	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	79.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	3.7	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	79.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	40	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	40	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	3.7	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	79.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5.2	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	6	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	60	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	6000	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	6000	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	60000	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	60000	NR	NR	ug/L	LAB	2000. Ribeiro, R., I. Lopes, A.M.M. Pereira, F. Goncalves, and A.M.V.M. Soares. Survival Time of Ceriodaphnia dubia in Acid Waters with Metal Contamination. Bull. Environ. Contam. Toxicol.64(1): 130-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	30		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	30	NR	NR	ug/L	LAB	2008. Poynton, H.C., A.V. Loguinov, J.R. Varshavsky, S. Chan, E.J. Perkins, and C.D. Vulpe. Gene Expression Profiling in Daphnia magna. Part I: Concentration-Dependent Profiles Provide Support for the No Observed Transcriptional Effect Level. Environ. Sci. Technol.42(16): 6250-6256.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	35	NA	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	6	NA	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	7.5	NA	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1982. Ingersoll, C.G., and R.W. Winner. Effect on Daphnia pulex (De Geer) of Daily Pulse Exposures to Copper or Cadmium. Environ. Toxicol. Chem.1: 321-327.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	NR	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	10		NC	ug/L	LAB	2004. Clement, B., and S. Zaid. A New Protocol to Measure the Effects of Toxicants on Daphnid-Algae Interactions. Chemosphere55(10): 1429-1438.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	15		NC	ug/L	LAB	2004. Clement, B., and S. Zaid. A New Protocol to Measure the Effects of Toxicants on Daphnid-Algae Interactions. Chemosphere55(10): 1429-1438.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	90	NR	NR	ug/L	LAB	2001. Atienzar, F.A., V.V. Cheung, A.N. Jha, and M.H. Depledge. Fitness Parameters and DNA Effects are Sensitive Indicators of Copper-Induced Toxicity in Daphnia magna. Toxicol. Sci.59(2): 241-250.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	19		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	5		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	27		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	48	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	12.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	12.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	12.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	A	NR	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	12.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	12.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	12.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	12.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	12.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	D	772	NA	NR	ug/L	LAB	1985. Shaner, S.W., and A.W. Knight. The Role of Alkalinity in the Mortality of Daphnia magna in Bioassays of Sediment-Bound Copper. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.82(2): 273-277.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Ferrando, M.D., C. Janssen, E. Andreu, and G. Persoone. Ecotoxicological Studies with the Freshwater Rotifer Brachionus calyciflorus. Resource Competition Between Rotifers and Daphnids Under Toxic Stress. Sci. Total Environ.Suppl: 1059-1069.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	32	D	27	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	12	D	10	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	78		NC	ug/L	LAB	2005. Mahar, A.M., and M.C. Watzin. Effects of Metal and Organophosphate Mixtures on Ceriodaphnia dubia Survival and Reproduction. Environ. Toxicol. Chem.24(7): 1579-1586.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	130	NA	NR	ug/L	LAB	1992. Pittinger, C.A., D.J. Versteeg, B.A. Blatz, and E.M. Meiers. Environmental Toxicology of Succinate Tartrates. Aquat. Toxicol.24(1-2): 83-102.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Bodar, C.W.M., A.V.D. Zee, P.A. Voogt, H. Wynne, and D.I. Zandee. Toxicity of Heavy Metals to Early Life Stages of Daphnia magna. Ecotoxicol. Environ. Saf.17(3): 333-338.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1987. Gerasimov, Y.L.. Toxic Action of Copper on Daphnia magna (Crustacea, Cladocera) at Different Feed Concentrations. Dokl. Akad. Nauk SSSR293(6): 1510-1513.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1999. Ma, H., S.D. Kim, D.K. Cha, and H.E. Allen. Effect of Kinetics of Complexation by Humic Acid on Toxicity of Copper to Ceriodaphnia dubia. Environ. Toxicol. Chem.18(5): 828-837.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1999. Ma, H., S.D. Kim, D.K. Cha, and H.E. Allen. Effect of Kinetics of Complexation by Humic Acid on Toxicity of Copper to Ceriodaphnia dubia. Environ. Toxicol. Chem.18(5): 828-837.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1999. Ma, H., S.D. Kim, D.K. Cha, and H.E. Allen. Effect of Kinetics of Complexation by Humic Acid on Toxicity of Copper to Ceriodaphnia dubia. Environ. Toxicol. Chem.18(5): 828-837.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1999. Ma, H., S.D. Kim, D.K. Cha, and H.E. Allen. Effect of Kinetics of Complexation by Humic Acid on Toxicity of Copper to Ceriodaphnia dubia. Environ. Toxicol. Chem.18(5): 828-837.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1999. Ma, H., S.D. Kim, D.K. Cha, and H.E. Allen. Effect of Kinetics of Complexation by Humic Acid on Toxicity of Copper to Ceriodaphnia dubia. Environ. Toxicol. Chem.18(5): 828-837.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Koivisto, S., and M. Ketola. Effects of Copper on Life-History Traits of Daphnia pulex and Bosmina longirostris. Aquat. Toxicol.32(2-3): 255-269.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	60	NA	NR	ug/L	LAB	1989. Moore, M.V., and R.W. Winner. Relative Sensitivity of Cerodaphnia dubia Laboratory Tests and Pond Communities of Zooplankton and Benthos to Chronic Copper Stress. Aquat. Toxicol.15(4): 311-330.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
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Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Lazareva, L.P.. Changes in Biological Characteristics of Daphnia magna from Chronic Action of Copper and Nickel at Low Concentrations. Hydrobiol. J.21(5): 59-62.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
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Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Martins, N., I. Lopes, L. Guilhermino, M.J. Bebianno, and R. Ribeiro. Lack of Evidence for Metallothionein Role in Tolerance to Copper by Natural Populations of Daphnia longispina. Bull. Environ. Contam. Toxicol.74(4): 761-768.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1.12	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	2000. Long, K.E.. The Effect of Low Hardness and pH on Copper Toxicity to Daphnia magna. M.S.Thesis, Clemson Univ., Clemson, SC: 75 p..

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Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1985. Preshing, M.. Effect of Certain Toxicants on the Survival Rate of Daphnia magna in a Three-Factor Experiment. Hydrobiol. J.21: 1-4.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	30	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	30	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
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Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	0.25	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	400*	NA	NR	ug/L	LAB	1972. Pawlaczyk-Szpilowa, M., M. Moskal, and J. Weretelnik. Przydatnosc Testow Biologicznych D Okreslenia Toksycznosci Niektorych Zwiazkow Chemicznych W Wodach (The Usefulness of Biological Tests for Determining the Toxicity of Some Chemical Compounds in Water. Acta Hydrobiol.14(2): 115-127.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
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Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	60	NA	NR	ug/L	LAB	1976. Winner, R.W.. Toxicity of Copper to Daphnids in Reconstituted and Natural Waters. EPA-600/3-76-051, U.S.EPA, Duluth, MN: 68 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	0.25	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
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Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NA	NR	ug/L	LAB	1976. Winner, R.W.. Toxicity of Copper to Daphnids in Reconstituted and Natural Waters. EPA-600/3-76-051, U.S.EPA, Duluth, MN: 68 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	7.5	NA	NR	ug/L	LAB	1976. Winner, R.W.. Toxicity of Copper to Daphnids in Reconstituted and Natural Waters. EPA-600/3-76-051, U.S.EPA, Duluth, MN: 68 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
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Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1982. Flickinger, A.L., R.J.F. Bruins, R.W. Winner, and J.H. Skillings. Filtration and Phototactic Behavior as Indices of Chronic Copper Stress in Daphnia magna Straus. Arch. Environ. Contam. Toxicol.11(4): 457-463.

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Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Koivisto, S., and M. Ketola. Effects of Copper on Life-History Traits of Daphnia pulex and Bosmina longirostris. Aquat. Toxicol.32(2-3): 255-269.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	6	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	4	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	25	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	30	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
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Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
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Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
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Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	30	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	16*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	32*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1982. Ingersoll, C.G., and R.W. Winner. Effect on Daphnia pulex (De Geer) of Daily Pulse Exposures to Copper or Cadmium. Environ. Toxicol. Chem.1: 321-327.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1988. Taub, F.B., A.C. Kindig, L.L. Conquest, and J.P. Meador. Standardized Aquatic Microcosms: Ecological Responses to Toxicants. Aquat. Toxicol.11(3-4): 422-423.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Kim, S.D., H. Ma, H.E. Allen, and D.K. Cha. Influence of Dissolved Organic Matter on the Toxicity of Copper to Ceriodaphnia dubia: Effect of Complexation Kinetics. Environ. Toxicol. Chem.18(11): 2433-2437.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	122.5	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2003. Khangarot, B.S., and R.S. Rathore. Effects of Copper on Respiration, Reproduction, and Some Biochemical Parameters of Water Flea Daphnia magna Straus. Bull. Environ. Contam. Toxicol.70(1): 112-117.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	200	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	500	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	500	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	500	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	500	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	10.1	NA	NR	ug/L	LAB	1984. Winner, R.W.. Selenium Effects on Antennal Integrity and Chronic Copper Toxicity in Daphnia pulex (deGeer). Bull. Environ. Contam. Toxicol.33(5): 605-611.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	LAB	2006. Dekker, T., G.D. Greve, T.L. Ter Laak, M.E. Boivin, B. Veuger, G. Gortzak, S. Dumfries, S.M.G. Lucker, M.H.S. Kraak, W.. Development and Application of a Sediment Toxicity Test Using the Benthic Cladoceran Chydorus sphaericus. Environ. Pollut.140(2): 231-238.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	6.4		NC	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	1.8	T	3.3	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	107	T	118	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	107	T	131	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	116	T	151	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	123	T	146	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	196	T	239	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	2.3	T	5.2	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	3.7	T	3.2	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	4.4	T	7.7	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	5.4	T	4.2	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	81.1	T	94	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	125		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	125		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	125		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	125		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	125		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	125		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	125		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	75		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	179	NR	NR	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Chronic Dietary Copper Exposure on Growth and Reproduction of Daphnia magna. Environ. Toxicol. Chem.23(8): 2038-2047.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	100	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	150	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	5		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	13.05		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	5		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	13.3		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	24		NC	ug/L	LAB	2001. Sobral, O., C. Chastinet, A. Nogueira, A.M.V.M. Soares, F. Goncalves, and R. Ribeiro. In Vitro Development of Parthenogenetic Eggs: A Fast Ecotoxicity Test with Daphnia magna?. Ecotoxicol. Environ. Saf.50(3): 174-179.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	180	NA	NR	ug/L	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	40	NR	NR	ug/L	LAB	2005. Martins, N., I. Lopes, L. Guilhermino, M.J. Bebianno, and R. Ribeiro. Lack of Evidence for Metallothionein Role in Tolerance to Copper by Natural Populations of Daphnia longispina. Bull. Environ. Contam. Toxicol.74(4): 761-768.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	0.000024	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	60	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	10.4	NR	NR	ug/L	LAB	2000. Long, K.E.. The Effect of Low Hardness and pH on Copper Toxicity to Daphnia magna. M.S.Thesis, Clemson Univ., Clemson, SC: 75 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	64	NR	NR	ug/L	LAB	2007. Hoang, T.C., J.S. Gallagher, J.R. Tomasso, and S.J. Klaine. Toxicity of Two Pulsed Metal Exposures to Daphnia magna: Relative Effects of Pulsed Duration-Concentration and Influence of Interpulse Period. Arch. Environ. Contam. Toxicol.53(4): 579-589.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	2	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	56	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	56	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	2000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	2000	NR	NR	ug/L	LAB	1956. Fisher, A.. The Effect of Copper-Sulphate on Some Micro-Organisms in Fish Ponds. Bamidgeh8(2): 21-27.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	500*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	300*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	64*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	6000	NR	NR	ug/L	LAB	1956. Fisher, A.. The Effect of Copper-Sulphate on Some Micro-Organisms in Fish Ponds. Bamidgeh8(2): 21-27.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	500	NR	NR	ug/L	LAB	1956. Fisher, A.. The Effect of Copper-Sulphate on Some Micro-Organisms in Fish Ponds. Bamidgeh8(2): 21-27.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NR	NR	ug/L	LAB	1956. Fisher, A.. The Effect of Copper-Sulphate on Some Micro-Organisms in Fish Ponds. Bamidgeh8(2): 21-27.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NR	NR	ug/L	LAB	1956. Fisher, A.. The Effect of Copper-Sulphate on Some Micro-Organisms in Fish Ponds. Bamidgeh8(2): 21-27.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	20	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	60	NR	NR	ug/L	LAB	1985. Winner, R.W.. Bioaccumulation and Toxicity of Copper as Affected by Interactions Between Humic Acid and Water Hardness. Water Res.19(4): 449-455.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	22		NC	ug/L	LAB	2002. Orchard, S.J., D.A. Holdway, C. Barata, and R.A. Van Dam. A Rapid Response Toxicity Test Based on the Feeding Rate of the Tropical Cladoceran Moinodaphnia macleayi. Ecotoxicol. Environ. Saf.53(1): 12-19.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	80		NC	ug/L	LAB	2004. Lopes, I., D.J. Baird, and R. Ribeiro. Genetic Determination of Tolerance to Lethal and Sublethal Copper Concentrations in Field Populations of Daphnia longispina. Arch. Environ. Contam. Toxicol.46(1): 43-51.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	250	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	250	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	250	NR	NR	ug/L	LAB	2003. Shcherban, E.P., P.N. Linnik, and T.A. Vasilchuk. Bioassay of the Toxicity of the Aquatic Environment Containing the Ions of Cu (II) and Humic Acids. Hydrobiol. J.39(3): 93-110.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	D	1.6		NC	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	D	51.9		NC	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	D	1.3	T	3	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	D	1.6	T	1.6	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	D	31.5	T	39.4	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	D	38.2	T	43.6	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	D	81	T	94.4	ug/L	LAB	2002. ENSR International. Application of the Biotic Ligand Model (BLM): Copper at Selected Locations in the Taunton River Basin in Massachusetts. ENSR Int.Doc.No.8734-324-100, Mass.Dep.of Environ.Prot.Bur.of Resour.Prot.and U.S.EPA, Region 1, ENSR Int., Westford, MA: 943 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	75		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	75		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	75		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	75	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug	LAB	2007. De Schamphelaere, K.A.C., I. Forrez, K. Dierckens, P. Sorgeloos, and C.R. Janssen. Chronic Toxicity of Dietary Copper to Daphnia magna. Aquat. Toxicol.81(4): 409-418.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	1.3	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	40	NA	NR	ug/L	LAB	1989. Moore, M.V., and R.W. Winner. Relative Sensitivity of Cerodaphnia dubia Laboratory Tests and Pond Communities of Zooplankton and Benthos to Chronic Copper Stress. Aquat. Toxicol.15(4): 311-330.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	18	NA	NR	ug/L	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.000001	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	32	NR	NR	ug/L	LAB	2007. Hoang, T.C., J.S. Gallagher, J.R. Tomasso, and S.J. Klaine. Toxicity of Two Pulsed Metal Exposures to Daphnia magna: Relative Effects of Pulsed Duration-Concentration and Influence of Interpulse Period. Arch. Environ. Contam. Toxicol.53(4): 579-589.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.64	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	D	80	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.39	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC05	Not Reported	T	2.6		NC	ug/L	LAB	2002. Orchard, S.J., D.A. Holdway, C. Barata, and R.A. Van Dam. A Rapid Response Toxicity Test Based on the Feeding Rate of the Tropical Cladoceran Moinodaphnia macleayi. Ecotoxicol. Environ. Saf.53(1): 12-19.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	T	86	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	53.8	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	58.2	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	68.7	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	69	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	71.3	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	72.7	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	T	61	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	38.7	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	45.6	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	45.9	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	46.5	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	50.2	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	51.1	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	51.9	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	56.1	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	56.2	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	57.1	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	68.2	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	70.5	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	T	7.5		NC	ug/L	LAB	2001. Knops, M., R. Altenburger, and H. Segner. Alterations of Physiological Energetics, Growth and Reproduction of Daphnia magna Under Toxicant Stress. Aquat. Toxicol.53(2): 79-90.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC20	Not Reported	T	9.5		NC	ug/L	LAB	2002. Orchard, S.J., D.A. Holdway, C. Barata, and R.A. Van Dam. A Rapid Response Toxicity Test Based on the Feeding Rate of the Tropical Cladoceran Moinodaphnia macleayi. Ecotoxicol. Environ. Saf.53(1): 12-19.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	159		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	326	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	348	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	357	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	108		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	115		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	122		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	122		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	138		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	144		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	144		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	145		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	145		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	152		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	152		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	152		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	154		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	156		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	157		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	166		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	182		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	192		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	195		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	195		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	216		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	250		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	263		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	276		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	316		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	34.6		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	41.5		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	45.8		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	48.3		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	49		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	49.7		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	57		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	70.6		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	84.8		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	99.4		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	90	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	113	NR	NR	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Chronic Dietary Copper Exposure on Growth and Reproduction of Daphnia magna. Environ. Toxicol. Chem.23(8): 2038-2047.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	121	NR	NR	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Chronic Dietary Copper Exposure on Growth and Reproduction of Daphnia magna. Environ. Toxicol. Chem.23(8): 2038-2047.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	67.8	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	74.8	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	75.7	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	76.3	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	79.6	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	81.2	NR	NR	ug/L	LAB	2005. Bossuyt, B.T.A., Y.R. Escobar, and C.R. Janssen. Multigeneration Acclimation of Daphnia magna Straus to Different Bioavailable Copper Concentrations. Ecotoxicol. Environ. Saf.61(3): 327-336.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	97	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	48	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	55.6	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	56.4	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	65.2	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	67.6	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	68.5	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	70.2	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	70.5	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	70.7	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	72.7	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	74.6	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	78.8	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. The Response of the Three Brood Ceriodaphnia Test to Fifteen Formulations and Pure Compounds in Common Use. Arch. Environ. Contam. Toxicol.21(1): 35-40.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	36.2		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	34		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	1.8	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	30.4		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	24		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	23		NC	ug/L	LAB	2002. Orchard, S.J., D.A. Holdway, C. Barata, and R.A. Van Dam. A Rapid Response Toxicity Test Based on the Feeding Rate of the Tropical Cladoceran Moinodaphnia macleayi. Ecotoxicol. Environ. Saf.53(1): 12-19.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	35	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	D	89	L	16	ug/L	LAB	2007. Martin, A.J., and R. Goldblatt. Speciation, Behavior, and Bioavailability of Copper Downstream of a Mine-Impacted Lake. Environ. Toxicol. Chem.26(12): 2594-2603.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	D	156	L	24	ug/L	LAB	2007. Martin, A.J., and R. Goldblatt. Speciation, Behavior, and Bioavailability of Copper Downstream of a Mine-Impacted Lake. Environ. Toxicol. Chem.26(12): 2594-2603.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	D	75	L	15	ug/L	LAB	2007. Martin, A.J., and R. Goldblatt. Speciation, Behavior, and Bioavailability of Copper Downstream of a Mine-Impacted Lake. Environ. Toxicol. Chem.26(12): 2594-2603.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	14.4	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	2.5	NR	NR	ng/d	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	10.9	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	10.9	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	19.6	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	19.9	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	20.6	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	67	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	88.3	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	9.2	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	9.3	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	96.5	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC25	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Schwartz, M.L., and B. Vigneault. Development and Validation of a Chronic Copper Biotic Ligand Model for Ceriodaphnia dubia. Aquat. Toxicol.84(2): 247-254.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	15	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	5	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper chloride (CuCl)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Progeny	T	41.6		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	45.3	NR	NR	g/g dry f	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	45.3	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	5.3	NR	NR	ng/d	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	5.3	NR	NR	ng/d	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	38.2	NA	NR	ug/L	LAB	1991. Oris, J.T., R.W. Winner, and M.V. Moore. A Four-Day Survival and Reproduction Toxicity Test for Ceriodaphnia dubia. Environ. Toxicol. Chem.10(2): 217-224.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	40.4	NA	NR	ug/L	LAB	1991. Oris, J.T., R.W. Winner, and M.V. Moore. A Four-Day Survival and Reproduction Toxicity Test for Ceriodaphnia dubia. Environ. Toxicol. Chem.10(2): 217-224.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	30.8	NA	NR	ug/L	LAB	1991. Oris, J.T., R.W. Winner, and M.V. Moore. A Four-Day Survival and Reproduction Toxicity Test for Ceriodaphnia dubia. Environ. Toxicol. Chem.10(2): 217-224.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	30.7	NA	NR	ug/L	LAB	1991. Oris, J.T., R.W. Winner, and M.V. Moore. A Four-Day Survival and Reproduction Toxicity Test for Ceriodaphnia dubia. Environ. Toxicol. Chem.10(2): 217-224.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	17.6	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	17.7	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	26.3	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	28.7	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	4.7	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	5	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	8.1	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	8.2	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	50		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	14	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	6	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	9.9	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	19.3	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	109		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	111		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	111		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	140		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	141		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	145		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	146		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	153		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	154		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	157		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	158		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	160		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	161		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	163		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	164		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	166		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	179		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	180		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	183		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	200		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	203		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	247		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	249		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	259		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	265		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	279		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	42.4		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	47.3		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	47.5		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	48.3		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	48.8		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	57.1		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	57.8		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	81.4		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	90		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2002. Semsari, S., H.A. Amar, Z. Badani, and B. Benayad. Study of the Inhibition of Certain Trophic Levels by the Presence of Metal Cations in Water. Desalination150(2): 177-188.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1975. Winner, R.. Food Type Related to Copper Sensitivity of Daphnids. In: Int.Conf.on Heavy Metals in the Environment, Abstracts, Institute for Environmental Studies, University of Toronto, Ontario, Canada: C295 - C297.
Copper chloride (CuCl)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Progeny	T	10		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	25		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	5		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	75		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	75		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	75		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	75		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	75		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	75		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	75		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	90	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	30	NA	NR	ug/L	LAB	1985. Blaylock, B.G., M.L. Frank, and J.F. McCarthy. Comparative Toxicity of Copper and Acridine to Fish, Daphnia and Algae. Environ. Toxicol. Chem.4(1): 63-71.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1985. Blaylock, B.G., M.L. Frank, and J.F. McCarthy. Comparative Toxicity of Copper and Acridine to Fish, Daphnia and Algae. Environ. Toxicol. Chem.4(1): 63-71.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	90	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	90	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	D	5	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	5		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	5		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	50		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	30	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	30	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	2.6	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	60	NR	NR	ug/L	LAB	2006. Lopes, I., D.J. Baird, and R. Ribeiro. Genetic Adaptation to Metal Stress by Natural Populations of Daphnia longispina. Ecotoxicol. Environ. Saf.63(2): 275-285.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	19		NC	ug/L	LAB	2002. Orchard, S.J., D.A. Holdway, C. Barata, and R.A. Van Dam. A Rapid Response Toxicity Test Based on the Feeding Rate of the Tropical Cladoceran Moinodaphnia macleayi. Ecotoxicol. Environ. Saf.53(1): 12-19.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	15.9	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	60	NR	NR	ug/L	LAB	2001. Atienzar, F.A., V.V. Cheung, A.N. Jha, and M.H. Depledge. Fitness Parameters and DNA Effects are Sensitive Indicators of Copper-Induced Toxicity in Daphnia magna. Toxicol. Sci.59(2): 241-250.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	NR	NR	NR	ug	LAB	2007. De Schamphelaere, K.A.C., I. Forrez, K. Dierckens, P. Sorgeloos, and C.R. Janssen. Chronic Toxicity of Dietary Copper to Daphnia magna. Aquat. Toxicol.81(4): 409-418.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	56.8		NC	mol/g foo	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	27		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	3.53		NC	umol/g	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	27		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	32	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	48	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	48	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	16	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	64	NR	NR	ug/L	LAB	2007. Hoang, T.C., J.S. Gallagher, J.R. Tomasso, and S.J. Klaine. Toxicity of Two Pulsed Metal Exposures to Daphnia magna: Relative Effects of Pulsed Duration-Concentration and Influence of Interpulse Period. Arch. Environ. Contam. Toxicol.53(4): 579-589.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	11	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	5	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	10.1	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	7.9	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	45	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	34.6	NA	NR	ug/L	LAB	1991. Oris, J.T., R.W. Winner, and M.V. Moore. A Four-Day Survival and Reproduction Toxicity Test for Ceriodaphnia dubia. Environ. Toxicol. Chem.10(2): 217-224.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	34.6	NA	NR	ug/L	LAB	1991. Oris, J.T., R.W. Winner, and M.V. Moore. A Four-Day Survival and Reproduction Toxicity Test for Ceriodaphnia dubia. Environ. Toxicol. Chem.10(2): 217-224.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	24.5	NA	NR	ug/L	LAB	1991. Oris, J.T., R.W. Winner, and M.V. Moore. A Four-Day Survival and Reproduction Toxicity Test for Ceriodaphnia dubia. Environ. Toxicol. Chem.10(2): 217-224.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	34.6	NA	NR	ug/L	LAB	1991. Oris, J.T., R.W. Winner, and M.V. Moore. A Four-Day Survival and Reproduction Toxicity Test for Ceriodaphnia dubia. Environ. Toxicol. Chem.10(2): 217-224.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	25		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	219	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	79	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	79	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	4	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	6.3	NA	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Winner, R.W., and H.A. Owen. Toxicity of Copper to Chlamydomonas reinhardtii (Chlorophyceae) and Ceriodaphnia dubia (Crustacea) in Relation to Changes in Water Chemistry of a Freshwater Pond. Aquat. Toxicol.21: 157-170.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	101		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	111		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	112		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	114		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	120.3		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	121		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	121		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	135		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	145		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	153.1		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	162.5		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	190		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	196		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	213		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	228		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	29.4		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	30.3		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	31.8		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	31.8		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	40.8		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	41.9		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	46.7		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	56.8		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	68.8		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	76.7		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	78.6		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	79.7		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	81.2		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	84.7		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	85.9		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	87.4		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	89.2		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	90.2		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	93.1		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	93.5		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Dissolved Organic Carbon Concentration and Source, pH, and Water Hardness on Chronic Toxicity of Copper to Daphnia magna. Environ. Toxicol. Chem.23(5): 1115-1122.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	15	NR	NR	ug/L	LAB	2002. Semsari, S., H.A. Amar, Z. Badani, and B. Benayad. Study of the Inhibition of Certain Trophic Levels by the Presence of Metal Cations in Water. Desalination150(2): 177-188.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1975. Winner, R.. Food Type Related to Copper Sensitivity of Daphnids. In: Int.Conf.on Heavy Metals in the Environment, Abstracts, Institute for Environmental Studies, University of Toronto, Ontario, Canada: C295 - C297.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2009. Mirza, R.S., and G.G. Pyle. Waterborne Metals Impair Inducible Defences in Daphnia pulex: Morphology, Life-History Traits and Encounters with Predators. Freshw. Biol.54(5): 1016-1027.
Copper chloride (CuCl)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Progeny	T	5		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	12		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	25		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	25		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	25		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	35		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	35		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	50		NC	ug/L	LAB	2003. Bossuyt, B.T.A., and C.R. Janssen. Acclimation of Daphnia magna to Environmentally Realistic Copper Concentrations. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.136(3): 253-264.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	75	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1985. Blaylock, B.G., M.L. Frank, and J.F. McCarthy. Comparative Toxicity of Copper and Acridine to Fish, Daphnia and Algae. Environ. Toxicol. Chem.4(1): 63-71.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1985. Blaylock, B.G., M.L. Frank, and J.F. McCarthy. Comparative Toxicity of Copper and Acridine to Fish, Daphnia and Algae. Environ. Toxicol. Chem.4(1): 63-71.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	75	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	92.5	NR	NR	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Chronic Dietary Copper Exposure on Growth and Reproduction of Daphnia magna. Environ. Toxicol. Chem.23(8): 2038-2047.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	96.2	NR	NR	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Effects of Chronic Dietary Copper Exposure on Growth and Reproduction of Daphnia magna. Environ. Toxicol. Chem.23(8): 2038-2047.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	75	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	1	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	0.4	NA	NR	ug/L	LAB	1993. Roux, D.J., P.L. Kempster, E. Truter, and L. Van der Merwe. Effect of Cadmium and Copper on Survival and Reproduction of Daphnia pulex. Water SA19(4): 269-274.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	160	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	96	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Nitric acid, Copper(2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	96	NA	NR	ug/L	LAB	1991. Cowgill, U.M., and D.P. Milazzo. Comparison of the Effect of Metallic Copper and Copper Nitrate (Cu(NO3)2.3H2O) on Ceriodaphnia dubia Utilizing the Three-Brood Test. Bull. Environ. Contam. Toxicol.46(1): 141-145.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	5		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	5		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	25		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	132	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	9.6	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3.2	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	48.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1993. Cerda, B., and J.H. Olive. Effects of Diet on Seven-Day Ceriodaphnia dubia Toxicity Tests. Ohio J. Sci.93(3): 44-47.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	14.1	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	163	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	150	NR	NR	ug/L	LAB	2008. Johnson, B.M., M.M. Chao, O.R. Tedrow, A.D. McQueen, and J.H.,Jr. Rodgers. Responses of Lepomis macrochirus, Pimephales promelas, Hyalella azteca, Ceriodaphnia dubia, and Daphnia magna to Exposures of Algimycin PWF and Copper Sulfate Pentahydrate. J. Aquat. Plant Manage.46: 176-183.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	200	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	400	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1.3	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	60	NR	NR	ug/L	LAB	2006. Lopes, I., D.J. Baird, and R. Ribeiro. Genetic Adaptation to Metal Stress by Natural Populations of Daphnia longispina. Ecotoxicol. Environ. Saf.63(2): 275-285.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	60	NR	NR	ug/L	LAB	2006. Lopes, I., D.J. Baird, and R. Ribeiro. Genetic Adaptation to Metal Stress by Natural Populations of Daphnia longispina. Ecotoxicol. Environ. Saf.63(2): 275-285.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Lopes, I., D.J. Baird, and R. Ribeiro. Genetic Adaptation to Metal Stress by Natural Populations of Daphnia longispina. Ecotoxicol. Environ. Saf.63(2): 275-285.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	10		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	5	NA	NR	ug/L	LAB	1982. Ingersoll, C.G., and R.W. Winner. Effect on Daphnia pulex (De Geer) of Daily Pulse Exposures to Copper or Cadmium. Environ. Toxicol. Chem.1: 321-327.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	9.2		NC	ug/L	LAB	2002. Orchard, S.J., D.A. Holdway, C. Barata, and R.A. Van Dam. A Rapid Response Toxicity Test Based on the Feeding Rate of the Tropical Cladoceran Moinodaphnia macleayi. Ecotoxicol. Environ. Saf.53(1): 12-19.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	56		NC	ug/L	LAB	2003. Khangarot, B.S., and R.S. Rathore. Effects of Copper on Respiration, Reproduction, and Some Biochemical Parameters of Water Flea Daphnia magna Straus. Bull. Environ. Contam. Toxicol.70(1): 112-117.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	NR	NR	NR	g/g dry f	LAB	2006. Sofyan, A., J.R. Shaw, and W.J. Birge. Metal Trophic Transfer from Algae to Cladocerans and the Relative Importance of Dietary Metal Exposure. Environ. Toxicol. Chem.25(4): 1034-1041.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2001. Atienzar, F.A., V.V. Cheung, A.N. Jha, and M.H. Depledge. Fitness Parameters and DNA Effects are Sensitive Indicators of Copper-Induced Toxicity in Daphnia magna. Toxicol. Sci.59(2): 241-250.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	25		NC	ug/L	LAB	2004. Hunter, K., and G. Pyle. Morphological Responses of Daphnia pulex to Chaoborus americanus Kairomone in the Presence and Absence of Metals. Environ. Toxicol. Chem.23(5): 1311-1316.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	5		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	19		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	17.9		NC	umol/g	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	17.9		NC	ol/g dry	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	3.19		NC	umol/g	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	3.19		NC	ol/g dry	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	4.37		NC	umol/g	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	4.37		NC	ol/g dry	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	D	0.149		NC	uM	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	D	0.129		NC	uM	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	19		NC	ug/L	LAB	2003. Harmon, S.M., W.L. Specht, and G.T. Chandler. A Comparison of the Daphnids Ceriodaphnia dubia and Daphnia ambigua for Their Utilization in Routine Toxicity Testing in the Southeastern United States. Arch. Environ. Contam. Toxicol.45(1): 79-85.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	16	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	8	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	32	NR	NR	ug/L	LAB	2007. Hoang, T.C., J.S. Gallagher, J.R. Tomasso, and S.J. Klaine. Toxicity of Two Pulsed Metal Exposures to Daphnia magna: Relative Effects of Pulsed Duration-Concentration and Influence of Interpulse Period. Arch. Environ. Contam. Toxicol.53(4): 579-589.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	32	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	48	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	12.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	12.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	12.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	135	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	150	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	17.5	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	40	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	45	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	70	NR	NR	ug/L	LAB	1998. Francisco, D.E., J.A. Terrell, and G.M. Melia. An Evaluation of the Source(s) of Test Animals as a Component of Interlaboratory Variability in the "NC Mini-chronic Pass/Fail Ceriodaphnia Effluent Toxicity Test". Proj. No. 50182, Univ.of North Carolina at Chapel Hill, School of Public Health, Chapel Hill, NC: 38 p..
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	A	NR	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	49	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	24.1	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Belanger, S.E., J.L. Farris, and D.S. Cherry. Effects of Diet, Water Hardness, and Population Source on Acute and Chronic Copper Toxicity to Ceriodaphnia dubia. Arch. Environ. Contam. Toxicol.18(4): 601-611.
Copper	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	10.1	NA	NR	ug/L	LAB	1984. Winner, R.W.. Selenium Effects on Antennal Integrity and Chronic Copper Toxicity in Daphnia pulex (deGeer). Bull. Environ. Contam. Toxicol.33(5): 605-611.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	12	D	10	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	32	D	27	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	78		NC	ug/L	LAB	2005. Mahar, A.M., and M.C. Watzin. Effects of Metal and Organophosphate Mixtures on Ceriodaphnia dubia Survival and Reproduction. Environ. Toxicol. Chem.24(7): 1579-1586.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Van Dam, R.A., M.J. Barry, J.T. Ahokas, and D.A. Holdway. Investigating Mechanisms of Diethylenetriamine Pentaacetic Acid Toxicity to the Cladoceran, Daphnia carinata. Aquat. Toxicol.46(3): 191-210.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	NR	NA	NR	ug/L	LAB	1972. Adema, D.M.M., and A.M. Degroot-Van Zijl. The Influence of Copper on the Water Flea Daphnia magna (De Invloed van Koper op de Watervlo Daphnia magna). TNO Nieuws27(9): 474-482.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	2004. Bossuyt, B.T.A., and C.R. Janssen. Influence of Multigeneration Acclimation to Copper on Tolerance, Energy Reserves, and Homeostasis of Daphnia magna Straus. Environ. Toxicol. Chem.23(8): 2029-2037.
Copper chloride (CuCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Koivisto, S., and M. Ketola. Effects of Copper on Life-History Traits of Daphnia pulex and Bosmina longirostris. Aquat. Toxicol.32(2-3): 255-269.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR		NC	ug/L	LAB	2001. Gagneten, A.M., and I. Vila. Effects of Cu+2 and pH on the Fitness of Ceriodaphnia dubia (Richard 1894) (Crustacea, Cladocera) in Microcosm Experiments. Environ. Toxicol.16(5): 428-438.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1989. Moore, M.V., and R.W. Winner. Relative Sensitivity of Cerodaphnia dubia Laboratory Tests and Pond Communities of Zooplankton and Benthos to Chronic Copper Stress. Aquat. Toxicol.15(4): 311-330.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1989. Moore, M.V., and R.W. Winner. Relative Sensitivity of Cerodaphnia dubia Laboratory Tests and Pond Communities of Zooplankton and Benthos to Chronic Copper Stress. Aquat. Toxicol.15(4): 311-330.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	40	NA	NR	ug/L	LAB	1989. Moore, M.V., and R.W. Winner. Relative Sensitivity of Cerodaphnia dubia Laboratory Tests and Pond Communities of Zooplankton and Benthos to Chronic Copper Stress. Aquat. Toxicol.15(4): 311-330.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	40	NA	NR	ug/L	LAB	1989. Moore, M.V., and R.W. Winner. Relative Sensitivity of Cerodaphnia dubia Laboratory Tests and Pond Communities of Zooplankton and Benthos to Chronic Copper Stress. Aquat. Toxicol.15(4): 311-330.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Gama-Flores, J.L., M.E. Castellanos-Paez, S.S.S. Sarma, and S. Nandini. Life Table Demography of Ceriodaphnia dubia (Cladocera) Exposed to Copper at Different Levels and Periods. J. Environ. Biol.28(3): 691-696.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	2000. Long, K.E.. The Effect of Low Hardness and pH on Copper Toxicity to Daphnia magna. M.S.Thesis, Clemson Univ., Clemson, SC: 75 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	2000. Long, K.E.. The Effect of Low Hardness and pH on Copper Toxicity to Daphnia magna. M.S.Thesis, Clemson Univ., Clemson, SC: 75 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	2000. Long, K.E.. The Effect of Low Hardness and pH on Copper Toxicity to Daphnia magna. M.S.Thesis, Clemson Univ., Clemson, SC: 75 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	2000. Long, K.E.. The Effect of Low Hardness and pH on Copper Toxicity to Daphnia magna. M.S.Thesis, Clemson Univ., Clemson, SC: 75 p..
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Lazareva, L.P.. Changes in Biological Characteristics of Daphnia magna from Chronic Action of Copper and Nickel at Low Concentrations. Hydrobiol. J.21(5): 59-62.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug	LAB	1968. Hueck, H.J., and D.M.M. Adema. Toxicological Investigations in an Artificial Ecosystem. A Progress Report on Copper Toxicity Towards Algae and Daphniae. Helgol. Wiss. Meeresunters.17: 188-199.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Chang, C., and T.H. Sibley. Accumulation and Transfer of Copper by Oocystis pusilla. Bull. Environ. Contam. Toxicol.50(5): 689-695.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	20	NA	NR	ug/L	LAB	1981. Winner, R.W.. A Comparison of Body Length, Brood Size and Longevity as Indices of Chronic Copper and Zinc Stresses in Daphnia magna. Environ. Pollut. A.26: 33-37.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	30	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	30	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	30	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	10	NA	NR	ug/L	LAB	1982. Flickinger, A.L., R.J.F. Bruins, R.W. Winner, and J.H. Skillings. Filtration and Phototactic Behavior as Indices of Chronic Copper Stress in Daphnia magna Straus. Arch. Environ. Contam. Toxicol.11(4): 457-463.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	20	NA	NR	ug/L	LAB	1982. Flickinger, A.L., R.J.F. Bruins, R.W. Winner, and J.H. Skillings. Filtration and Phototactic Behavior as Indices of Chronic Copper Stress in Daphnia magna Straus. Arch. Environ. Contam. Toxicol.11(4): 457-463.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	40	NA	NR	ug/L	LAB	1982. Flickinger, A.L., R.J.F. Bruins, R.W. Winner, and J.H. Skillings. Filtration and Phototactic Behavior as Indices of Chronic Copper Stress in Daphnia magna Straus. Arch. Environ. Contam. Toxicol.11(4): 457-463.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Koivisto, S., and M. Ketola. Effects of Copper on Life-History Traits of Daphnia pulex and Bosmina longirostris. Aquat. Toxicol.32(2-3): 255-269.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Koivisto, S., M. Ketola, and M. Walls. Comparison of Five Cladoceran Species in Short- and Long-Term Copper Exposure. Hydrobiologia248(2): 125-136.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Ingersoll, C.G., and R.W. Winner. Effect on Daphnia pulex (De Geer) of Daily Pulse Exposures to Copper or Cadmium. Environ. Toxicol. Chem.1: 321-327.
Sulfuric acid copper(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	29.3	NA	NR	ug/L	LAB	1984. Winner, R.W.. The Toxicity and Bioaccumulation of Cadmium and Copper as Affected by Humic Acid. Aquat. Toxicol.5(3): 267-274.
Copper	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	18	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	4.8	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	73	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	7	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Copper	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	25	NR	NR	ug/L	LAB	2004. Ingersoll, C.. Memo Summarizing Ammonia Toxicity Data for Freshwater Mussels Generated by the USGS Columbia Environmental Research Center in 2003 and 2004. Memorandum, USGS Columbia Environ.Res.Cntr., Columbia, MO: 13 p..
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	17.6	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	44.5	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	50.4	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	12.5	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	127.2	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	22	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	D	40.8	NR	NR	ug/L	LAB	2008. Gillis, P.L., R.J. Mitchell, A.N. Schwalb, K.A. McNichols, G.L. Mackie, C.M. Wood, and J.D. Ackerman. Sensitivity of the Glochidia (Larvae) of Freshwater Mussels to Copper: Assessing the Effect of Water Hardness and Dissolved Organic Carbon on the Sensitivity of Endangered Species. Aquat. Toxicol.88: 137-145.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	58	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	16	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	18	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	4.8	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	6.7	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	56	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	73	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	6.5	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	7.3	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	21	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	EC50	Not Reported	T	25	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	46	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	48	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1997. Jacobson, P.J., R.J. Neves, D.S. Cherry, and J.L. Farris. Sensitivity of Glochidial Stages of Freshwater Mussels (Bivalvia: Unionidae) to Copper. Environ. Toxicol. Chem.16(11): 2384-2392.
Sulfuric acid copper(2+) salt (1:1)	White Grub	Worms	Fresh	Mortality	LC50	Not Reported	T	32	NR	NR	ug/L	LAB	1998. Soucek, D.J., and G.P. Noblet. Copper Toxicity to the Endoparasitic Trematode (Posthodiplostomum minimum) Relative to Physid Snail and Bluegill Sunfish Intermediate Hosts. Environ. Toxicol. Chem.17(12): 2512-2516.
Sulfuric acid copper(2+) salt (1:1)	White Grub	Worms	Fresh	Mortality	LC50	Not Reported	T	26	NR	NR	ug/L	LAB	1998. Soucek, D.J., and G.P. Noblet. Copper Toxicity to the Endoparasitic Trematode (Posthodiplostomum minimum) Relative to Physid Snail and Bluegill Sunfish Intermediate Hosts. Environ. Toxicol. Chem.17(12): 2512-2516.
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1495	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4100	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8100	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	993	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	509	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	379	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	880	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	720	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	780	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1275	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Sulfuric acid copper(2+) salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	2700	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Sulfuric acid copper(2+) salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7700	NR	NR	ug/L	LAB	1978. Simonet, D.E., W.I. Knausenberger, L.H.,Jr. Townsend, and E.C.,Jr. Turner. A Biomonitoring Procedure Utilizing Negative Phototaxis of First Instar Aedes aegypti Larvae. Arch. Environ. Contam. Toxicol.7(3): 339-347.
Sulfuric acid copper(2+) salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	48*	NA	NR	ug/L	LAB	1977. Thibault, D.H., and J.E. Guthrie. Mosquito Larvae: Test Organisms for Screening Liquid Effluents for Their Potential Toxicity. Manit. Entomol.11: 61-68.
Sulfuric acid copper(2+) salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	172*	NA	NR	ug/L	LAB	1977. Thibault, D.H., and J.E. Guthrie. Mosquito Larvae: Test Organisms for Screening Liquid Effluents for Their Potential Toxicity. Manit. Entomol.11: 61-68.
Sulfuric acid copper(2+) salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5200	NR	NR	ug/L	LAB	1978. Simonet, D.E., W.I. Knausenberger, L.H.,Jr. Townsend, and E.C.,Jr. Turner. A Biomonitoring Procedure Utilizing Negative Phototaxis of First Instar Aedes aegypti Larvae. Arch. Environ. Contam. Toxicol.7(3): 339-347.
Sulfuric acid copper(2+) salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2500	NR	NR	ug/L	LAB	1978. Simonet, D.E., W.I. Knausenberger, L.H.,Jr. Townsend, and E.C.,Jr. Turner. A Biomonitoring Procedure Utilizing Negative Phototaxis of First Instar Aedes aegypti Larvae. Arch. Environ. Contam. Toxicol.7(3): 339-347.
Copper	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Gut	T	3200	NR	NR	ug/L	LAB	1998. Rayms-Keller, A., K.E. Olson, M. McGaw, C. Oray, J.O. Carlson, and B.J. Beaty. Effect of Heavy Metals on Aedes aegypti (Diptera: Culicidae) Larvae. Ecotoxicol. Environ. Saf.39(1): 41-47.
Copper	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Gut	T	320	NR	NR	ug/L	LAB	1998. Rayms-Keller, A., K.E. Olson, M. McGaw, C. Oray, J.O. Carlson, and B.J. Beaty. Effect of Heavy Metals on Aedes aegypti (Diptera: Culicidae) Larvae. Ecotoxicol. Environ. Saf.39(1): 41-47.
Copper	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	33000	NR	NR	ug/L	LAB	1998. Rayms-Keller, A., K.E. Olson, M. McGaw, C. Oray, J.O. Carlson, and B.J. Beaty. Effect of Heavy Metals on Aedes aegypti (Diptera: Culicidae) Larvae. Ecotoxicol. Environ. Saf.39(1): 41-47.
Sulfuric acid copper(2+) salt (1:1)	Yellow Sandshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	36	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Zebra Mussel	Molluscs	Fresh	Growth	NOEC	Shell	T	NR	NR	NR	ug/L	LAB	2004. Lecoeur, S., B. Videmann, and P. Berny. Evaluation of Metallothionein as a Biomarker of Single and Combined Cd/Cu Exposure in Dreissena polymorpha. Environ. Res.94(2): 184-191.
Sulfuric acid copper(2+) salt (1:1)	Zebra Mussel	Molluscs	Fresh	Growth	NOEC	Shell	T	10	NR	NR	ug/L	LAB	2004. Lecoeur, S., B. Videmann, and P. Berny. Evaluation of Metallothionein as a Biomarker of Single and Combined Cd/Cu Exposure in Dreissena polymorpha. Environ. Res.94(2): 184-191.
Copper	Zebra Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1996. Mersch, J., P. Wagner, and J.C. Pihan. Copper in Indigenous and Transplanted Zebra Mussels in Relation to Changing Water Concentrations and Body Weight. Environ. Toxicol. Chem.15(6): 886-893.
Copper chloride (CuCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	107		NC	ug/L	LAB	2000. Prasada Rao, D.G.V., and M.A.Q. Khan. Zebra Mussels: Enhancement of Copper Toxicity by high Temperature and Its Relationship with Respiration and Metabolism. Water Environ. Res.72(2): 175-178.
Copper chloride (CuCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	487		NC	ug/L	LAB	2000. Prasada Rao, D.G.V., and M.A.Q. Khan. Zebra Mussels: Enhancement of Copper Toxicity by high Temperature and Its Relationship with Respiration and Metabolism. Water Environ. Res.72(2): 175-178.
Copper chloride (CuCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	238	NR	NR	ug/L	LAB	1997. Rao, D.G.V.P., and M.A.Q. Khan. Zebra Mussels: Potentiation of Copper Toxicity at High Temperature and Its Relationship with Respiration and Metabolism. In: Proc.WETEC 97 Water Environ.Fed.Annu.Conf.Expo., 70th Publ.: Water Environ.Fed., Alexandria, VA4: 357-363.
Copper chloride (CuCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	775	NR	NR	ug/L	LAB	1997. Rao, D.G.V.P., and M.A.Q. Khan. Zebra Mussels: Potentiation of Copper Toxicity at High Temperature and Its Relationship with Respiration and Metabolism. In: Proc.WETEC 97 Water Environ.Fed.Annu.Conf.Expo., 70th Publ.: Water Environ.Fed., Alexandria, VA4: 357-363.
Copper chloride (CuCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	107	NR	NR	ug/L	LAB	1997. Rao, D.G.V.P., and M.A.Q. Khan. Zebra Mussels: Potentiation of Copper Toxicity at High Temperature and Its Relationship with Respiration and Metabolism. In: Proc.WETEC 97 Water Environ.Fed.Annu.Conf.Expo., 70th Publ.: Water Environ.Fed., Alexandria, VA4: 357-363.
Copper chloride (CuCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	487	NR	NR	ug/L	LAB	1997. Rao, D.G.V.P., and M.A.Q. Khan. Zebra Mussels: Potentiation of Copper Toxicity at High Temperature and Its Relationship with Respiration and Metabolism. In: Proc.WETEC 97 Water Environ.Fed.Annu.Conf.Expo., 70th Publ.: Water Environ.Fed., Alexandria, VA4: 357-363.
Sulfuric acid copper(2+) salt (1:1)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4	NR	NR	ug/L	LAB	2006. Kennedy, A.J., R.N. Millward, J.A. Steevens, J.W. Lynn, and K.D. Perry. Relative Sensitivity of Zebra Mussel (Dreissena polymorpha) Life-Stages to Two Copper Sources. J. Great Lakes Res.32(3): 596-606.
Sulfuric acid copper(2+) salt (1:1)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5	NR	NR	ug/L	LAB	2006. Kennedy, A.J., R.N. Millward, J.A. Steevens, J.W. Lynn, and K.D. Perry. Relative Sensitivity of Zebra Mussel (Dreissena polymorpha) Life-Stages to Two Copper Sources. J. Great Lakes Res.32(3): 596-606.
Sulfuric acid copper(2+) salt (1:1)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7	NR	NR	ug/L	LAB	2006. Kennedy, A.J., R.N. Millward, J.A. Steevens, J.W. Lynn, and K.D. Perry. Relative Sensitivity of Zebra Mussel (Dreissena polymorpha) Life-Stages to Two Copper Sources. J. Great Lakes Res.32(3): 596-606.
Sulfuric acid copper(2+) salt (1:1)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8	NR	NR	ug/L	LAB	2006. Kennedy, A.J., R.N. Millward, J.A. Steevens, J.W. Lynn, and K.D. Perry. Relative Sensitivity of Zebra Mussel (Dreissena polymorpha) Life-Stages to Two Copper Sources. J. Great Lakes Res.32(3): 596-606.
Sulfuric acid copper(2+) salt (1:1)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5380	NA	NR	ug/L	LAB	1993. Waller, D.L., J.J. Rach, W.G. Cope, L.L. Marking, S.W. Fisher, and H. Dabrowska. Toxicity of Candidate Molluscicides to Zebra Mussels (Dreissena polymorpha) and Selected Nontarget Organisms. J. Great Lakes Res.19(4): 695-702.
Sulfuric acid copper(2+) salt (1:1)	Zebra Mussel	Molluscs	Fresh	Mortality	LC99	Not Reported	T	14	NR	NR	ug/L	LAB	2006. Kennedy, A.J., R.N. Millward, J.A. Steevens, J.W. Lynn, and K.D. Perry. Relative Sensitivity of Zebra Mussel (Dreissena polymorpha) Life-Stages to Two Copper Sources. J. Great Lakes Res.32(3): 596-606.
Sulfuric acid copper(2+) salt (1:1)	Zebra Mussel	Molluscs	Fresh	Mortality	LC99	Not Reported	T	16	NR	NR	ug/L	LAB	2006. Kennedy, A.J., R.N. Millward, J.A. Steevens, J.W. Lynn, and K.D. Perry. Relative Sensitivity of Zebra Mussel (Dreissena polymorpha) Life-Stages to Two Copper Sources. J. Great Lakes Res.32(3): 596-606.
Sulfuric acid copper(2+) salt (1:1)	Zebra Mussel	Molluscs	Fresh	Mortality	LC99	Not Reported	T	20	NR	NR	ug/L	LAB	2006. Kennedy, A.J., R.N. Millward, J.A. Steevens, J.W. Lynn, and K.D. Perry. Relative Sensitivity of Zebra Mussel (Dreissena polymorpha) Life-Stages to Two Copper Sources. J. Great Lakes Res.32(3): 596-606.
Sulfuric acid copper(2+) salt (1:1)	Zebra Mussel	Molluscs	Fresh	Mortality	LC99	Not Reported	T	21	NR	NR	ug/L	LAB	2006. Kennedy, A.J., R.N. Millward, J.A. Steevens, J.W. Lynn, and K.D. Perry. Relative Sensitivity of Zebra Mussel (Dreissena polymorpha) Life-Stages to Two Copper Sources. J. Great Lakes Res.32(3): 596-606.
Copper	Zebra Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1996. Mersch, J., P. Wagner, and J.C. Pihan. Copper in Indigenous and Transplanted Zebra Mussels in Relation to Changing Water Concentrations and Body Weight. Environ. Toxicol. Chem.15(6): 886-893.
Copper chloride (CuCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	49	NA	NR	ug/L	LAB	1993. Kraak, M.H.S., D. Lavy, M. Toussaint, H. Schoon, W.H.M. Peeters, and C. Davids. Toxicity of Heavy Metals to the Zebra Mussel (Dreissena polymorpha). In: T.F.Nalepa and D.W.Schloesser (Eds.), Zebra Mussels - Biology, Impacts, and Control, Chapter 29, Lewis Publishers, Boca Raton, FL: 491-502.

Table B-12. Summary of Results from the EcoTox Database for Invertebrates - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Kraak, M.H.S., D. Lavy, W.H.M. Peeters, and C. Davids. Chronic Ecotoxicity of Copper and Cadmium to the Zebra Mussel Dreissena polymorpha. Arch. Environ. Contam. Toxicol.23(3): 363-369.
Copper	Zebra Mussel	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	F	10000		NR	ug/L	LAB	1996. Waller, D.L., S.W. Fisher, and H. Dabrowska. Prevention of Zebra Mussel Infestation and Dispersal During Aquaculture Operations. Prog. Fish-Cult.58(2): 77-84.
Copper chloride (CuCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NA	NR	ug/L	LAB	1993. Kraak, M.H.S., D. Lavy, M. Toussaint, H. Schoon, W.H.M. Peeters, and C. Davids. Toxicity of Heavy Metals to the Zebra Mussel (Dreissena polymorpha). In: T.F.Nalepa and D.W.Schloesser (Eds.), Zebra Mussels - Biology, Impacts, and Control, Chapter 29, Lewis Publishers, Boca Raton, FL: 491-502.
Copper chloride (CuCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	23	NR	NR	ug/L	LAB	1999. Stuijfzand, S.C., M.J. Jonker, E. Van Ammelrooy, and W. Admiraal. Species-Specific Responses to Metals in Organically Enriched River Water, with Emphasis on Effects of Humic Acids. Environ. Pollut.106(1): 115-121.
Copper chloride (CuCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	98	NR	NR	ug/L	LAB	2006. Bouskill, N.J., R.D. Handy, T.E. Ford, and T.S. Galloway. Differentiating Copper and Arsenic Toxicity Using Biochemical Biomarkers in Asellus aquaticus and Dreissena polymorpha. Ecotoxicol. Environ. Saf.65(3): 342-349.

Table B-13. Summary of Results from the EcoTox Database for Invertebrates - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron	Amphipod	Crustaceans	Fresh	Mortality	LC50		A	NR			ug/L	LAB	. . . .
Sulfuric acid, Iron (2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	419200	NA	NR	ug/L	LAB	1987. Maltby, L., J.O.H. Snart, and P. Calow. Acute Toxicity Tests on the Freshwater Isopod, Asellus aquaticus Using FeSO4.7H2O, with Special Reference to Techniques and the Possibility of Intraspecific Variation. Environ. Pollut.43(4): 271-279.
Sulfuric acid, Iron (2+) salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	430500	NA	NR	ug/L	LAB	1987. Maltby, L., J.O.H. Snart, and P. Calow. Acute Toxicity Tests on the Freshwater Isopod, Asellus aquaticus Using FeSO4.7H2O, with Special Reference to Techniques and the Possibility of Intraspecific Variation. Environ. Pollut.43(4): 271-279.
Iron chloride (FeCl3)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80480	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	81080*	NA	NR	ug/L	LAB	1979. Furmanska, M.. Studies of the Effect of Copper, Zinc, and Iron on the Biotic Components of Aquatic Ecosystems. Pol. Arch. Hydrobiol.26(1-2): 213-220.
Iron chloride (FeCl3)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Sulfuric acid, Iron salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	86500	NA	NR	ug/L	LAB	1991. Mullick, S., and S.K. Konar. Combined Effects of Zinc, Copper, Iron and Lead on Plankton. Environ. Ecol.9(1): 187-198.
Iron chloride	Ciliate	Invertebrates	Fresh	Growth	NR		T	5000	NA	NR	ug/L	LAB	1979. Bovee, E.C., D.A. Kegley, D. Sternshein, E. Wyttenbach, and B.L. Bergquist. Alleviation of the Toxicity of Copper to Tetrahymena pyriformis by Nontoxic Iron. Univ.Kans.Sci.Bull.51(24): 679-684.
Sulfuric acid, Iron (2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	3800		NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid, Iron (2+) salt (1:1)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	7670		NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Iron chloride	Copepod	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	0.0001	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Iron chloride	Copepod	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.00001	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Iron chloride (FeCl3)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	13200	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Iron chloride (FeCl3)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	13900	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Iron chloride (FeCl3)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	18500	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Iron chloride (FeCl3)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	21000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Iron chloride (FeCl3)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	22000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Iron chloride (FeCl3)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	32000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Sulfuric acid, Iron (2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Iron (2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Iron (2+) salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Iron (2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1420	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.

Table B-13. Summary of Results from the EcoTox Database for Invertebrates - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Iron (2+) salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	1420	NA	NR	umol/L	LAB	1992. Calleja, M.C., and G. Persoone. Cyst-Based Toxicity Tests. IV. The Potential of Ecotoxicological Tests for the Prediction of Acute Toxicity in Man as Evaluated on the First Ten Chemicals of the MEIC Programme. ATLA Altern. Lab. Anim.20: 396-405.
Sulfuric acid, Iron (2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Sulfuric acid, Iron (2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	65300	NA	NR	ug/L	LAB	1994. Gerhardt, A.. Short Term Toxicity of Iron (Fe) and Lead (Pb) to the Mayfly Leptophlebia marginata (L.) (Insecta) in Relation to Freshwater Acidification. Hydrobiologia284(2): 157-168.
Iron	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	73070	NA	NR	ug/L	LAB	1995. Gerhardt, A.. Joint and Single Toxicity of Cd and Fe Related to Metal Uptake in the Mayfly Leptophlebia marginata (L.) (Insecta). Hydrobiologia306(3): 229-240.
Sulfuric acid, Iron (2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	89500	NA	NR	ug/L	LAB	1994. Gerhardt, A.. Short Term Toxicity of Iron (Fe) and Lead (Pb) to the Mayfly Leptophlebia marginata (L.) (Insecta) in Relation to Freshwater Acidification. Hydrobiologia284(2): 157-168.
Sulfuric acid, Iron (2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	106300	NA	NR	ug/L	LAB	1994. Gerhardt, A.. Short Term Toxicity of Iron (Fe) and Lead (Pb) to the Mayfly Leptophlebia marginata (L.) (Insecta) in Relation to Freshwater Acidification. Hydrobiologia284(2): 157-168.
Sulfuric acid, Iron (2+) salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	106300	NA	NR	ug/L	LAB	1994. Gerhardt, A.. Short Term Toxicity of Iron (Fe) and Lead (Pb) to the Mayfly Leptophlebia marginata (L.) (Insecta) in Relation to Freshwater Acidification. Hydrobiologia284(2): 157-168.
Iron	Mayfly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	1640	NA	NR	ug/L	FIELDN	1995. Gerhardt, A., and F. Westermann. Effects of Precipitations of Iron Hydroxides on Leptophlebia marginata (L.) (Insecta: Ephemeroptera) in the Field. Arch. Hydrobiol.133(1): 81-93.
Iron	Mayfly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1995. Gerhardt, A., and F. Westermann. Effects of Precipitations of Iron Hydroxides on Leptophlebia marginata (L.) (Insecta: Ephemeroptera) in the Field. Arch. Hydrobiol.133(1): 81-93.
Iron chloride	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	uM	LAB	1995. Postma, J.F., M. Kyed, and W. Admiraal. Site Specific Differentiation in Metal Tolerance in the Midge Chironomus riparius (Diptera, Chironomidae). Hydrobiologia315(2): 159-165.
Sulfuric acid, Iron (2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	400000	NA	NR	ug/L	LAB	1997. Rousch, J.M., T.W. Simmons, B.L. Kerans, and B.P. Smith. Relative Acute Effects of Low pH and High Iron on the Hatching and Survival of the Water Mite (Arrenurus manubriator) and the Aquatic Insect (Chironomus riparius). Environ. Toxicol. Chem.16(10): 2144-2150.
Sulfuric acid, Iron (2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	200000	NA	NR	ug/L	LAB	1997. Rousch, J.M., T.W. Simmons, B.L. Kerans, and B.P. Smith. Relative Acute Effects of Low pH and High Iron on the Hatching and Survival of the Water Mite (Arrenurus manubriator) and the Aquatic Insect (Chironomus riparius). Environ. Toxicol. Chem.16(10): 2144-2150.
Sulfuric acid, Iron (2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	1000000	NA	NR	ug/L	LAB	1997. Rousch, J.M., T.W. Simmons, B.L. Kerans, and B.P. Smith. Relative Acute Effects of Low pH and High Iron on the Hatching and Survival of the Water Mite (Arrenurus manubriator) and the Aquatic Insect (Chironomus riparius). Environ. Toxicol. Chem.16(10): 2144-2150.
Iron chloride	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	uM	LAB	1995. Postma, J.F., M. Kyed, and W. Admiraal. Site Specific Differentiation in Metal Tolerance in the Midge Chironomus riparius (Diptera, Chironomidae). Hydrobiologia315(2): 159-165.
Nitric acid, Iron(3+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	0.32	L	0.06	ug/L	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Iron chloride (FeCl3)	Nematode	Worms	Fresh	Mortality	NOEC	Not Reported	T	400000	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Iron chloride (FeCl3)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Iron chloride	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Jaworska, M., J. Sepiol, and P. Tomasik. Effect of Metal Ions Under Laboratory Conditions on the Entomopathogenic Steinernema carpocapsae (Rhabditida: Steinernematidae). Water Air Soil Pollut.88(3-4): 331-341.
Sulfuric acid, Iron (2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	180000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Iron (2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	220000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Iron (2+) salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	230000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Iron chloride (FeCl3)	Pine Wilt Nematode	Worms	Fresh	Mortality	LD50	Not Reported	T	0.00036	NR	NR	M	LAB	1984. Kobamoto, N., and Y. Izumi. The Nematicidal Effect of Metal Ions on the Pine Wood Nematode, Bursaphelenchus xylophilus. J. Pestic. Sci.9(3): 527-529.
Iron chloride (FeCl3)	Pine Wilt Nematode	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	0.001	NR	NR	M	LAB	1984. Kobamoto, N., and Y. Izumi. The Nematicidal Effect of Metal Ions on the Pine Wood Nematode, Bursaphelenchus xylophilus. J. Pestic. Sci.9(3): 527-529.

Table B-13. Summary of Results from the EcoTox Database for Invertebrates - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron chloride (FeCl3)	Pouch Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	12090	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Pouch Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Pouch Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	21320	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Sulfuric acid, Iron(3+) salt (3:2)	Protozoan	Invertebrates	Fresh	Mortality	LOEL	Not Reported	T	5		NC	%	LAB	1992. Robertson, L.J., A.T. Campbell, and H.V. Smith. Survival of Cryptosporidium parvum Oocysts Under Various Environmental Pressures. Appl. Environ. Microbiol.58(11): 3494-3500.
Sulfuric acid, Iron(3+) salt (3:2)	Protozoan	Invertebrates	Fresh	Mortality	LOEL	Not Reported	T	3500		NC	ug/L	LAB	1992. Robertson, L.J., A.T. Campbell, and H.V. Smith. Survival of Cryptosporidium parvum Oocysts Under Various Environmental Pressures. Appl. Environ. Microbiol.58(11): 3494-3500.
Sulfuric acid, Iron(3+) salt (3:2)	Protozoan	Invertebrates	Fresh	Mortality	NOEL	Not Reported	T	16000		NC	ug/L	LAB	1992. Robertson, L.J., A.T. Campbell, and H.V. Smith. Survival of Cryptosporidium parvum Oocysts Under Various Environmental Pressures. Appl. Environ. Microbiol.58(11): 3494-3500.
Iron chloride (FeCl3)	Ramshorn Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	73170*	NA	NR	ug/L	LAB	1979. Furmanska, M.. Studies of the Effect of Copper, Zinc, and Iron on the Biotic Components of Aquatic Ecosystems. Pol. Arch. Hydrobiol.26(1-2): 213-220.
Sulfuric acid, Iron (2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	23	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.
Sulfuric acid, Iron (2+) salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	F	230	NA	NR	umol/L	LAB	1992. Calleja, M.C., and G. Persoone. Cyst-Based Toxicity Tests. IV. The Potential of Ecotoxicological Tests for the Prediction of Acute Toxicity in Man as Evaluated on the First Ten Chemicals of the MEIC Programme. ATLA Altern. Lab. Anim.20: 396-405.
Sulfuric acid, Iron (2+) salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Maltby, L., and M. Crane. Responses of Gammarus pulex (Amphipoda, Crustacea) to Metalliferous Effluents: Identification of Toxic Components and the Importance of Interpopulation Variation. Environ. Pollut.84(1): 45-52.
Sulfuric acid, Iron (2+) salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8450	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Iron chloride (FeCl3)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	200000	NR	NR	ug/L	LAB	1961. Gohar, H.A.F., and H. El-Gindy. Tolerance of Vector Snails of Bilharziasis and Fascioliasis to Some Chemicals. Proc.Egypt Acad.Sci.16: 37-48.
Sulfuric acid, Iron (2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	800000	NR	NR	ug/L	LAB	1961. Gohar, H.A.F., and H. El-Gindy. Tolerance of Vector Snails of Bilharziasis and Fascioliasis to Some Chemicals. Proc.Egypt Acad.Sci.16: 37-48.
Iron chloride	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Iron chloride (FeCl3)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	200000	NR	NR	ug/L	LAB	1961. Gohar, H.A.F., and H. El-Gindy. Tolerance of Vector Snails of Bilharziasis and Fascioliasis to Some Chemicals. Proc.Egypt Acad.Sci.16: 37-48.
Sulfuric acid, Iron (2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	800000	NR	NR	ug/L	LAB	1961. Gohar, H.A.F., and H. El-Gindy. Tolerance of Vector Snails of Bilharziasis and Fascioliasis to Some Chemicals. Proc.Egypt Acad.Sci.16: 37-48.
Iron chloride (FeCl3)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	220000	NR	NR	ug/L	LAB	1961. Gohar, H.A.F., and H. El-Gindy. Tolerance of Vector Snails of Bilharziasis and Fascioliasis to Some Chemicals. Proc.Egypt Acad.Sci.16: 37-48.
Sulfuric acid, Iron (2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	900000	NR	NR	ug/L	LAB	1961. Gohar, H.A.F., and H. El-Gindy. Tolerance of Vector Snails of Bilharziasis and Fascioliasis to Some Chemicals. Proc.Egypt Acad.Sci.16: 37-48.
Iron chloride (FeCl3)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	220000	NR	NR	ug/L	LAB	1961. Gohar, H.A.F., and H. El-Gindy. Tolerance of Vector Snails of Bilharziasis and Fascioliasis to Some Chemicals. Proc.Egypt Acad.Sci.16: 37-48.
Sulfuric acid, Iron (2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	900000	NR	NR	ug/L	LAB	1961. Gohar, H.A.F., and H. El-Gindy. Tolerance of Vector Snails of Bilharziasis and Fascioliasis to Some Chemicals. Proc.Egypt Acad.Sci.16: 37-48.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	71260		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	83910		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	86090		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.

Table B-13. Summary of Results from the EcoTox Database for Invertebrates - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	95350		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	109910		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	110020		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	116050		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	125420		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	125420		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	134050		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	144470		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	144780		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	157820		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	174500		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	180000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	196050		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	180000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	320000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	56000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	56000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	56000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Not Reported	T	1310	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Growth	MATC	Not Reported	T	960	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..

Table B-13. Summary of Results from the EcoTox Database for Invertebrates - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	700	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1998. Van Dam, R.A., M.J. Barry, J.T. Ahokas, and D.A. Holdway. Effects of Water-Borne Iron and Calcium on the Toxicity of Diethylenetriamine Pentaacetic Acid (DTPA) to Daphnia carinata. Aquat. Toxicol.42(1): 49-66.
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	17	NR	NR	ug/L	LAB	2006. Oda, S., N. Tatarazako, H. Watanabe, M. Morita, and T. Iguchi. Genetic Differences in the Production of Male Neonates in Daphnia magna Exposed to Juvenile Hormone Analogs. Chemosphere63(9): 1477-1484.
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	19	NR	NR	ug/L	LAB	2006. Oda, S., N. Tatarazako, H. Watanabe, M. Morita, and T. Iguchi. Genetic Differences in the Production of Male Neonates in Daphnia magna Exposed to Juvenile Hormone Analogs. Chemosphere63(9): 1477-1484.
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	19	NR	NR	ug/L	LAB	2006. Oda, S., N. Tatarazako, H. Watanabe, M. Morita, and T. Iguchi. Genetic Differences in the Production of Male Neonates in Daphnia magna Exposed to Juvenile Hormone Analogs. Chemosphere63(9): 1477-1484.
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1996. Sorvari, J., and M. Sillanpaa. Influence of Metal Complex Formation on Heavy Metal and Free EDTA and DTPA Acute Toxicity Determined by Daphnia magna. Chemosphere33(6): 1119-1127.
Sulfuric acid, Iron(3+) salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	ED50	Not Reported	T	11480		NC	ug/L	LAB	1999. Randall, S., D. Harper, and B. Brierley. Ecological and Ecophysiological Impacts of Ferric Dosing in Reservoirs. Hydrobiologia395-396: 355-364.
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	816	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30060	NR	NR	ug/L	LAB	1995. Fort, D.J., and E.L. Stover. Impact of Toxicities and Potential Interactions of Flocculants and Coagulant Aids on Whole Effluent Toxicity Testing. Water Environ. Res.67(6): 921-925.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36690	NR	NR	ug/L	LAB	1995. Fort, D.J., and E.L. Stover. Impact of Toxicities and Potential Interactions of Flocculants and Coagulant Aids on Whole Effluent Toxicity Testing. Water Environ. Res.67(6): 921-925.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9000	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10620	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12930	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15810	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17350	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..

Table B-13. Summary of Results from the EcoTox Database for Invertebrates - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	65000	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	69000	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	74000	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	76000	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	84000	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Iron(3+) salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	3000		NC	ug/L	LAB	1999. Randall, S., D. Harper, and B. Brierley. Ecological and Ecophysiological Impacts of Ferric Dosing in Reservoirs. Hydrobiologia395-396: 355-364.
Sulfuric acid, Iron(3+) salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	10000		NC	ug/L	LAB	1999. Randall, S., D. Harper, and B. Brierley. Ecological and Ecophysiological Impacts of Ferric Dosing in Reservoirs. Hydrobiologia395-396: 355-364.
Sulfuric acid, Iron(3+) salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	2000		NC	ug/L	LAB	1999. Randall, S., D. Harper, and B. Brierley. Ecological and Ecophysiological Impacts of Ferric Dosing in Reservoirs. Hydrobiologia395-396: 355-364.
Sulfuric acid, Iron(3+) salt (3:2)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	8000		NC	ug/L	LAB	1999. Randall, S., D. Harper, and B. Brierley. Ecological and Ecophysiological Impacts of Ferric Dosing in Reservoirs. Hydrobiologia395-396: 355-364.
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	0.0001	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	256	NA	NR	ug/L	LAB	1984. Dave, G.. Effects of Waterborne Iron on Growth, Reproduction, Survival and Haemoglobin in Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.78(2): 433-438.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2500	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5020	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	3880	NR	NR	ug/L	LAB	1998. Van Dam, R.A., M.J. Barry, J.T. Ahokas, and D.A. Holdway. Effects of Water-Borne Iron and Calcium on the Toxicity of Diethylenetriamine Pentaacetic Acid (DTPA) to Daphnia carinata. Aquat. Toxicol.42(1): 49-66.
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	0.001	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.

Table B-13. Summary of Results from the EcoTox Database for Invertebrates - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	18640	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	23940	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	23940	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	23940	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	1490	NR	NR	ug/L	LAB	1998. Van Dam, R.A., M.J. Barry, J.T. Ahokas, and D.A. Holdway. Effects of Water-Borne Iron and Calcium on the Toxicity of Diethylenetriamine Pentaacetic Acid (DTPA) to Daphnia carinata. Aquat. Toxicol.42(1): 49-66.
Iron chloride	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.00001	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	4000	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	5200	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Sulfuric acid, Iron(3+) salt (3:2)	Water Flea	Crustaceans	Fresh	Reproduction	ED50	Not Reported	T	4490		NC	ug/L	LAB	1999. Randall, S., D. Harper, and B. Brierley. Ecological and Ecophysiological Impacts of Ferric Dosing in Reservoirs. Hydrobiologia395-396: 355-364.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1310	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1310	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	960	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	960	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	700	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	700	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	3880	NR	NR	ug/L	LAB	1998. Van Dam, R.A., M.J. Barry, J.T. Ahokas, and D.A. Holdway. Effects of Water-Borne Iron and Calcium on the Toxicity of Diethylenetriamine Pentaacetic Acid (DTPA) to Daphnia carinata. Aquat. Toxicol.42(1): 49-66.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Van Dam, R.A., M.J. Barry, J.T. Ahokas, and D.A. Holdway. Investigating Mechanisms of Diethylenetriamine Pentaacetic Acid Toxicity to the Cladoceran, Daphnia carinata. Aquat. Toxicol.46(3): 191-210.
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Egg	T	1310	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..

Table B-13. Summary of Results from the EcoTox Database for Invertebrates - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron chloride (FeCl3)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Egg	T	2500	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Sulfuric acid, Iron (2+) salt (1:1)	Water Mite	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	1000000	NA	NR	ug/L	LAB	1997. Rousch, J.M., T.W. Simmons, B.L. Kerans, and B.P. Smith. Relative Acute Effects of Low pH and High Iron on the Hatching and Survival of the Water Mite (Arrenurus manubriator) and the Aquatic Insect (Chironomus riparius). Environ. Toxicol. Chem.16(10): 2144-2150.
Sulfuric acid, Iron (2+) salt (1:1)	Water Mite	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	1000000	NA	NR	ug/L	LAB	1997. Rousch, J.M., T.W. Simmons, B.L. Kerans, and B.P. Smith. Relative Acute Effects of Low pH and High Iron on the Hatching and Survival of the Water Mite (Arrenurus manubriator) and the Aquatic Insect (Chironomus riparius). Environ. Toxicol. Chem.16(10): 2144-2150.
Sulfuric acid, Iron (2+) salt (1:1)	Water Mite	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	800000	NA	NR	ug/L	LAB	1997. Rousch, J.M., T.W. Simmons, B.L. Kerans, and B.P. Smith. Relative Acute Effects of Low pH and High Iron on the Hatching and Survival of the Water Mite (Arrenurus manubriator) and the Aquatic Insect (Chironomus riparius). Environ. Toxicol. Chem.16(10): 2144-2150.
Sulfuric acid, Iron (2+) salt (1:1)	Water Mite	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	1000000	NA	NR	ug/L	LAB	1997. Rousch, J.M., T.W. Simmons, B.L. Kerans, and B.P. Smith. Relative Acute Effects of Low pH and High Iron on the Hatching and Survival of the Water Mite (Arrenurus manubriator) and the Aquatic Insect (Chironomus riparius). Environ. Toxicol. Chem.16(10): 2144-2150.
Sulfuric acid, Iron (2+) salt (1:1)	Water Mite	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	1000000	NA	NR	ug/L	LAB	1997. Rousch, J.M., T.W. Simmons, B.L. Kerans, and B.P. Smith. Relative Acute Effects of Low pH and High Iron on the Hatching and Survival of the Water Mite (Arrenurus manubriator) and the Aquatic Insect (Chironomus riparius). Environ. Toxicol. Chem.16(10): 2144-2150.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead	Amphipod	Crustaceans	Fresh	Mortality	LC50		AM	11			ug/L	LAB	. . . .
Nitric acid, Lead (2+) salt	Beet Nematode	Worms	Fresh	Growth	NOEL	Whole Organism	T	1000000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Nitric acid, Lead (2+) salt	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2580		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Nitric acid, Lead (2+) salt	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	4360		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Nitric acid, Lead (2+) salt	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	5050		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Nitric acid, Lead (2+) salt	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	7790		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Nitric acid, Lead (2+) salt	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	14800		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Nitric acid, Lead (2+) salt	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	30000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Nitric acid, Lead (2+) salt	Brown Gardensnail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Laskowski, R., and S.P. Hopkin. Effect of Zn, Cu, Pb and Cd on Fitness in Snails (Helix aspersa). Ecotoxicol. Environ. Saf.34(1): 59-69.
Nitric acid, Lead (2+) salt	Brown Gardensnail	Molluscs	Fresh	Reproduction	EC50	Not Reported	T	8300000	NR	NR	ug/L	LAB	1996. Laskowski, R., and S.P. Hopkin. Effect of Zn, Cu, Pb and Cd on Fitness in Snails (Helix aspersa). Ecotoxicol. Environ. Saf.34(1): 59-69.
Nitric acid, Lead (2+) salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3100	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Lead(II) sulfate	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	54500	NA	NR	ug/L	LAB	1991. Mullick, S., and S.K. Konar. Combined Effects of Zinc, Copper, Iron and Lead on Plankton. Environ. Ecol.9(1): 187-198.
Nitric acid, Lead (2+) salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	140	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Calanoid Copepod	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	45	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Lead chloride (PbCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Lead chloride (PbCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	230	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Lead chloride (PbCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2260	NA	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Lead chloride (PbCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2290	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Lead chloride (PbCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2810	NR	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Lead chloride (PbCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3280	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Lead chloride (PbCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Nitric acid, Lead (2+) salt	Ciliate	Invertebrates	Fresh	Mortality	LETC	Not Reported	T	156000*	NA	NR	ug/L	LAB	1973. Carter, J.W., and I.L. Cameron. Toxicity Bioassay of Heavy Metals in Water Using Tetrahymena-pyriformis. Water Res.7(7): 951-961.
Nitric acid, Lead (2+) salt	Ciliate	Invertebrates	Fresh	Mortality	LETC	Not Reported	T	26300*	NA	NR	ug/L	LAB	1973. Carter, J.W., and I.L. Cameron. Toxicity Bioassay of Heavy Metals in Water Using Tetrahymena-pyriformis. Water Res.7(7): 951-961.
Nitric acid, Lead (2+) salt	Ciliate	Invertebrates	NR	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Nasreen. Lethal Toxicity of Lead Nitrate to Tetrahymena pyriformis. Curr. Sci. (Bangalore)57(19): 1089-1091.
Nitric acid, Lead (2+) salt	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	56000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Nitric acid, Lead (2+) salt	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Lead chloride (PbCl2)	Ciliated Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1083	NA	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Ciliated Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	10780	NR	NR	ug/L	LAB	1998. Twagilimana, L., J. Bohatier, CA Groliere, F. Bonnemoy, and D. Sargos. A New Low-Cost Microbiotest with the Protozoan Spirostomum teres: Culture Conditions and Assessment of Sensitivity of the Ciliate to 14 Pure Chemicals. Ecotoxicol. Environ. Saf.41(3): 231-244.
Nitric acid, Lead (2+) salt	Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2600	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8000	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Copepod	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	2500	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Copepod	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	250	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Lead chloride (PbCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18925	NR	NR	ug/L	LAB	1994. Victor, B.. Gill Tissue Pathogenicity and Hemocyte Behavior in the Crab Paratelphusa hydrodromous Exposed to Lead Chloride. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control29(5): 1011-1034.
Lead chloride (PbCl2)	Crab	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	400000	NR	NR	ug/L	LAB	1994. Victor, B.. Gill Tissue Pathogenicity and Hemocyte Behavior in the Crab Paratelphusa hydrodromous Exposed to Lead Chloride. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control29(5): 1011-1034.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	420	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	530	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	740	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	770	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	780	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	800	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	840	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	910	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1030	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1160	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1270	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1400	NA	NR	ug/L	LAB	1982. Vareille-Morel, C., and C. Chaisemartin. Natural Tolerance and Acclimation of Different Populations of Austropotamobius pallipes (Le.) to Heavy Metals (Chromium and Lead). Acta Oecol. Oecol. Appl.3(1): 105-122.
Nitric acid, Lead (2+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150000		NC	ug/L	LAB	2006. Khan, M.A.Q., S.A. Ahmed, B. Catalin, A. Khodadoust, O. Ajayi, and M. Vaughn. Effect of Temperature on Heavy Metal Toxicity to Juvenile Crayfish, Orconectes immunis (Hagen). Environ. Toxicol.21(5): 513-520.
Lead chloride (PbCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	900	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Lead chloride (PbCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	900	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead chloride (PbCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	1500	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Lead chloride (PbCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	1700	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Lead chloride (PbCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	2600	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Lead chloride (PbCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	3300	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Nitric acid, Lead (2+) salt	Dragonfly	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	2.232	NR	NR	mM	LAB	2009. Tollett, V.D., E.L. Benvenutti, L.A. Deer, and T.M. Rice. Differential Toxicity to Cd, Pb, and Cu in Dragonfly Larvae (Insecta: Odonata). Arch. Environ. Contam. Toxicol.56(1): 77-84.
Nitric acid, Lead (2+) salt	Earthworm	Worms	NR	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Nitric acid, Lead (2+) salt	Earthworm	Worms	NR	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Nitric acid, Lead (2+) salt	Fairy Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Mizutani, A., E. Ifune, A. Zanella, and C. Eriksen. Uptake of Lead, Cadmium and Zinc by the Fairy Shrimp, Branchinecta longiantenna (Crustacea; Anostraca). Hydrobiologia212: 145-149.
Nitric acid, Lead (2+) salt	Fairy Shrimp	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1991. Mizutani, A., E. Ifune, A. Zanella, and C. Eriksen. Uptake of Lead, Cadmium and Zinc by the Fairy Shrimp, Branchinecta longiantenna (Crustacea; Anostraca). Hydrobiologia212: 145-149.
Lead chloride (PbCl2)	Freshwater Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1099	NR	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Nitric acid, Lead (2+) salt	Gammarid	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1987. Malyarevskaya, A.Y., and F.M. Karasina. Effect of Lead Nitrate on Physiological and Biochemical Characteristics of Certain Aquatic Invertebrates. Hydrobiol. J.23(1): 84-89.
Nitric acid, Lead (2+) salt	Giant Water Bug	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1360	NA	NR	ug/L	LAB	1989. Oladimeji, A.A., and B.O. Offem. Toxicity of Lead to Clarias lazera, Oreochromis niloticus, Chironomus tentans and Benacus sp. Water Air Soil Pollut.44(3): 191-201.
Nitric acid, Lead (2+) salt	Giant Water Bug	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1890	NA	NR	ug/L	LAB	1989. Oladimeji, A.A., and B.O. Offem. Toxicity of Lead to Clarias lazera, Oreochromis niloticus, Chironomus tentans and Benacus sp. Water Air Soil Pollut.44(3): 191-201.
Nitric acid, Lead (2+) salt	Lagoon Crab	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	mM	LAB	2009. Otitoloju, A.A., O.K. Elegba, and A.O. Osibona. Biological Responses in Edible Crab, Callinectes amnicola that Could Serve as Markers of Heavy Metals Pollution. Environmentalist (Lausanne)29(1): 37-46.
Nitric acid, Lead (2+) salt	Lagoon Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.041	NR	NR	mM	LAB	2009. Otitoloju, A.A., O.K. Elegba, and A.O. Osibona. Biological Responses in Edible Crab, Callinectes amnicola that Could Serve as Markers of Heavy Metals Pollution. Environmentalist (Lausanne)29(1): 37-46.
Nitric acid, Lead (2+) salt	Lagoon Crab	Crustaceans	Fresh	Mortality	LC95	Not Reported	T	0.073	NR	NR	mM	LAB	2009. Otitoloju, A.A., O.K. Elegba, and A.O. Osibona. Biological Responses in Edible Crab, Callinectes amnicola that Could Serve as Markers of Heavy Metals Pollution. Environmentalist (Lausanne)29(1): 37-46.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	357	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nitric acid, Lead (2+) salt	Marsh Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	12	NA	NR	ug/L	LAB	1978. Borgmann, U., O. Kramar, and C. Loveridge. Rates of Mortality, Growth, and Biomass Production of Lymnaea palustris During Chronic Exposures to Lead. J. Fish. Res. Board Can.35(8): 1109-1115.
Nitric acid, Lead (2+) salt	Marsh Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	19	NA	NR	ug/L	LAB	1978. Borgmann, U., O. Kramar, and C. Loveridge. Rates of Mortality, Growth, and Biomass Production of Lymnaea palustris During Chronic Exposures to Lead. J. Fish. Res. Board Can.35(8): 1109-1115.
Lead chloride (PbCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	EC10	Not Reported	D	169		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	EC20	Not Reported	D	230		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	D	333		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	D	664		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1090	NA	NR	ug/L	LAB	1994. Gerhardt, A.. Short Term Toxicity of Iron (Fe) and Lead (Pb) to the Mayfly Leptophlebia marginata (L.) (Insecta) in Relation to Freshwater Acidification. Hydrobiologia284(2): 157-168.
Nitric acid, Lead (2+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3500	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Nitric acid, Lead (2+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3500	NA	NR	ug/L	LAB	1976. Nehring, R.B.. Aquatic Insects as Biological Monitors of Heavy Metal Pollution. Bull. Environ. Contam. Toxicol.15(2): 147-154.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3500	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, Lead (2+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LETC	Not Reported	T	700	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Lead chloride (PbCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	D	350		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Nitric acid, Lead (2+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	700	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead chloride (PbCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	MATC	Not Reported	D	279		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	D	222		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Growth	EC10	Whole Organism	D	15		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Growth	EC20	Whole Organism	D	28		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Growth	LOEC	Whole Organism	D	75		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Growth	MATC	Whole Organism	D	65		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Growth	NOEC	Whole Organism	D	57		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Growth	NOEC	Whole Organism	F	5000	NR	NR	ug/L	LAB	2006. Lee, S.M., S.B. Lee, C.H. Park, and J. Choi. Expression of Heat Shock Protein and Hemoglobin Genes in Chironomus tentans (Diptera, Chironomidae) Larvae Exposed to Various Environmental Pollutants: A Potential Biomarker of Freshwater Monitoring. Chemosphere65(6): 1074-1081.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Growth	NOEC	Whole Organism	F	5000	NR	NR	ug/L	LAB	2006. Lee, S.M., S.B. Lee, C.H. Park, and J. Choi. Expression of Heat Shock Protein and Hemoglobin Genes in Chironomus tentans (Diptera, Chironomidae) Larvae Exposed to Various Environmental Pollutants: A Potential Biomarker of Freshwater Monitoring. Chemosphere65(6): 1074-1081.
Lead	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	728	NA	NR	ug/L	LAB	1992. Timmermans, K.R., W. Peeters, and M. Tonkes. Cadmium, Zinc, Lead and Copper in Chironomus riparius (Meigen) Larvae (Diptera, Chironomidae): Uptake and Effects. Hydrobiologia241(2): 119-134.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Ha, M.H., and J. Choi. Effects of Environmental Contaminants on Hemoglobin of Larvae of Aquatic Midge, Chironomus riparius (Diptera: Chironomidae): A Potential Biomarker for Ecotoxicity Monitoring. Chemosphere71(10): 1928-1936.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC10	Not Reported	T	1174000	NR	NR	ug/L	LAB	2008. Ha, M.H., and J. Choi. Effects of Environmental Contaminants on Hemoglobin of Larvae of Aquatic Midge, Chironomus riparius (Diptera: Chironomidae): A Potential Biomarker for Ecotoxicity Monitoring. Chemosphere71(10): 1928-1936.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC100	Not Reported	T	44000*	NA	NR	ug/L	LAB	1979. Rathore, H.S., P.K. Sanghvi, and H. Swarup. Toxicity of Cadmium Chloride and Lead Nitrate to Chironomus tentans Larvae. Environ. Pollut.18(3): 173-177.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	258	NA	NR	ug/L	LAB	1980. Anderson, R.L., C.T. Walbridge, and J.T. Fiandt. Survival and Growth of Tanytarsus dissimilis (Chironomidae) Exposed to Copper, Cadmium, Zinc, and Lead. Arch. Environ. Contam. Toxicol.9(3): 329-335.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	D	610	NR	NR	ug/L	LAB	2008. Bechard, K.M., P.L. Gillis, and C.M. Wood. Acute Toxicity of Waterborne Cd, Cu, Pb, Ni, and Zn to First-Instar Chironomus riparius Larvae. Arch. Environ. Contam. Toxicol.54(3): 454-459.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1770	NA	NR	ug/L	LAB	1989. Oladimeji, A.A., and B.O. Offem. Toxicity of Lead to Clarias lazera, Oreochromis niloticus, Chironomus tentans and Benacus sp. Water Air Soil Pollut.44(3): 191-201.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2680	NA	NR	ug/L	LAB	1989. Oladimeji, A.A., and B.O. Offem. Toxicity of Lead to Clarias lazera, Oreochromis niloticus, Chironomus tentans and Benacus sp. Water Air Soil Pollut.44(3): 191-201.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	D	3323		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	8200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	8300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	10500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	13500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	14200	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	16200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	18240	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	20500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	22000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	22600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	27500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	37850	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	37850	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	37850	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	47850	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	47850	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	220000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	224000	NA	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	350000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6693000	NR	NR	ug/L	LAB	2008. Ha, M.H., and J. Choi. Effects of Environmental Contaminants on Hemoglobin of Larvae of Aquatic Midge, Chironomus riparius (Diptera: Chironomidae): A Potential Biomarker for Ecotoxicity Monitoring. Chemosphere71(10): 1928-1936.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	50800*	NA	NR	ug/L	LAB	1986. Ziegenfuss, P.S., W.J. Renaudette, and W.J. Adams. Methodology for Assessing the Acute Toxicity of Chemicals Sorbed to Sediments: Testing the Equilibrium Partitioning Theory. In: T.M.Poston and R.Purdy (Eds.), Aquatic Toxicology and Environmental Fate, 9th Volume, ASTM STP 921, Philadelphia, PA: 479-493.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	NR	Mortality	LC50	Not Reported	T	31280*	NA	NR	ug/L	LAB	1981. Rao, D.S., and A.B. Saxena. Acute Toxicity of Mercury, Zinc, Lead, Cadmium, Manganese to the Chironomus sp. Int. J. Environ. Stud.16(3-4): 225-226.
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC90	Not Reported	T	38157000	NR	NR	ug/L	LAB	2008. Ha, M.H., and J. Choi. Effects of Environmental Contaminants on Hemoglobin of Larvae of Aquatic Midge, Chironomus riparius (Diptera: Chironomidae): A Potential Biomarker for Ecotoxicity Monitoring. Chemosphere71(10): 1928-1936.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	D	152		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Janssens de Bisthoven, L., A. Vermeulen, and F. Ollevier. Experimental Induction of Morphological Deformities in Chironomus riparius Larvae by Chronic Exposure to Copper and Lead. Arch. Environ. Contam. Toxicol.35: 249-256.
Lead chloride (PbCl2)	Midge	Insects/Spiders	Fresh	Reproduction	NOEC	Not Reported	D	152		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead	Monsson River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9800	NR	NR	ug/L	LAB	1996. Kabila, V., A. Yamuna, and P. Geraldine. Water Hardness as a Determinant of the Potential Toxicity of Lead to the Freshwater Prawn Macrobrachium malcolmsonii (H. Milne Edwards). Pollut. Res.15(1): 39-42.
Lead	Monsson River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	91510	NR	NR	ug/L	LAB	1996. Kabila, V., A. Yamuna, and P. Geraldine. Water Hardness as a Determinant of the Potential Toxicity of Lead to the Freshwater Prawn Macrobrachium malcolmsonii (H. Milne Edwards). Pollut. Res.15(1): 39-42.
Nitric acid, Lead (2+) salt	Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Black, M.C., J.R. Ferrell, R.C. Horning, and L.K.,Jr. Martin. DNA Strand Breakage in Freshwater Mussels (Anodonta grandis) Exposed to Lead in the Laboratory and Field. Environ. Toxicol. Chem.15(5): 802-808.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	0.26	L	0.106	mM	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Lead chloride (PbCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1.06	L	0.47	mmol/L	LAB	1997. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Predicting Relative Metal Toxicity with Ion Characteristics: Caenorhabditis elegans LC50. Aquat. Toxicol.39(3-4): 279-290.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	39	NR	NR	uM	LAB	1994. Stringham, E.G., and E.P.M. Candido. Transgenic hsp16-lacZ Strains of the Soil Nematode Caenorhabditis elegans as Biological Monitors of Environmental Stress. Environ. Toxicol. Chem.13(8): 1211-1220.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	810	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1500	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1700	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2100	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2900	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	4100	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	7500	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	7600	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	8200	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	8700	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	10400	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	13200	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	19500	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	22000	NR	NR	ug/L	LAB	1994. Stringham, E.G., and E.P.M. Candido. Transgenic hsp16-lacZ Strains of the Soil Nematode Caenorhabditis elegans as Biological Monitors of Environmental Stress. Environ. Toxicol. Chem.13(8): 1211-1220.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	129000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Donkin, S.G., and P.L. Williams. Influence of Developmental Stage, Salts and Food Presence on Various End Points Using Caenorhabditis elegans for Aquatic Toxicity Testing. Environ. Toxicol. Chem.14(12): 2139-2147.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Donkin, S.G., and P.L. Williams. Influence of Developmental Stage, Salts and Food Presence on Various End Points Using Caenorhabditis elegans for Aquatic Toxicity Testing. Environ. Toxicol. Chem.14(12): 2139-2147.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Nitric acid, Lead (2+) salt	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Jaworska, M., J. Sepiol, and P. Tomasik. Effect of Metal Ions Under Laboratory Conditions on the Entomopathogenic Steinernema carpocapsae (Rhabditida: Steinernematidae). Water Air Soil Pollut.88(3-4): 331-341.
Nitric acid, Lead (2+) salt	Oligochaete Family	Worms	Fresh	Mortality	LC50*	Not Reported	T	27500	NA	NR	ug/L	LAB	1968. Whitley, L.S.. The Resistance of Tubificid Worms to Three Common Pollutants. Hydrobiologia32(1-2): 193-205.
Nitric acid, Lead (2+) salt	Oligochaete Family	Worms	Fresh	Mortality	LC50*	Not Reported	T	49000	NA	NR	ug/L	LAB	1968. Whitley, L.S.. The Resistance of Tubificid Worms to Three Common Pollutants. Hydrobiologia32(1-2): 193-205.
Lead	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	740	NA	NR	ug/L	LAB	1995. Phipps, G.L., V.R. Mattson, and G.T. Ankley. Relative Sensitivity of Three Freshwater Benthic Macroinvertebrates to Ten Contaminants. Arch. Environ. Contam. Toxicol.28(3): 281-286.
Nitric acid, Lead (2+) salt	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1800	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
Nitric acid, Lead (2+) salt	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	3400	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
Nitric acid, Lead (2+) salt	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.6	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2160		NC	ug/L	LAB	1995. Brooks, A., R.M. White, and D.C. Paton. Effects of Heavy Metals on the Survival of Diacypris compacta (Herbst) (Ostracoda) from the Coorong, South Australia. Int. J. Salt Lake Res.4(2): 133-163.
Nitric acid, Lead (2+) salt	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3100		NC	ug/L	LAB	1995. Brooks, A., R.M. White, and D.C. Paton. Effects of Heavy Metals on the Survival of Diacypris compacta (Herbst) (Ostracoda) from the Coorong, South Australia. Int. J. Salt Lake Res.4(2): 133-163.
Nitric acid, Lead (2+) salt	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Nitric acid, Lead (2+) salt	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Nitric acid, Lead (2+) salt	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5500	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Ostracod	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	1400	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Ostracod	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	140	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Pea Cockle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	23500	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Nitric acid, Lead (2+) salt	Pea Cockle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	23600	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Nitric acid, Lead (2+) salt	Pea Cockle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	56000	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Nitric acid, Lead (2+) salt	Penaeidean Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Penaeidean Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Nitric acid, Lead (2+) salt	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	400000	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Lead chloride (PbCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Lead chloride (PbCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Lead chloride (PbCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1261	NA	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Lead chloride (PbCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1616	NA	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Lead chloride (PbCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2177	NA	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Lead chloride (PbCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2323	NA	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Nitric acid, Lead (2+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2670	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Nitric acid, Lead (2+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3400	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Lead chloride (PbCl2)	Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	875	NR	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Lead chloride (PbCl2)	Protozoan Phylum	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Nitric acid, Lead (2+) salt	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	T	19000	NR	NR	ug/L	LAB	2001. Bat, L., A. Guendogdu, M. Akbulut, M. Culha, and H.H. Satilmis. Toxicity of Zinc and Lead to the Polychaete (Hediste diversicolor Mueller 1776). Turk. J. Mar. Sci.7(2): 71-84.
Nitric acid, Lead (2+) salt	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	T	28000	NR	NR	ug/L	LAB	2001. Bat, L., A. Guendogdu, M. Akbulut, M. Culha, and H.H. Satilmis. Toxicity of Zinc and Lead to the Polychaete (Hediste diversicolor Mueller 1776). Turk. J. Mar. Sci.7(2): 71-84.
Nitric acid, Lead (2+) salt	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	T	48000	NR	NR	ug/L	LAB	2001. Bat, L., A. Guendogdu, M. Akbulut, M. Culha, and H.H. Satilmis. Toxicity of Zinc and Lead to the Polychaete (Hediste diversicolor Mueller 1776). Turk. J. Mar. Sci.7(2): 71-84.
Nitric acid, Lead (2+) salt	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	T	65000	NR	NR	ug/L	LAB	2001. Bat, L., A. Guendogdu, M. Akbulut, M. Culha, and H.H. Satilmis. Toxicity of Zinc and Lead to the Polychaete (Hediste diversicolor Mueller 1776). Turk. J. Mar. Sci.7(2): 71-84.
Nitric acid, Lead (2+) salt	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	751570	NA	NR	ug/L	LAB	1993. Naqvi, S.M., and R.D. Howell. Toxicity of Cadmium and Lead to Juvenile Red Swamp Crayfish, Procambarus clarkii, and Effects on Fecundity of Adults. Bull. Environ. Contam. Toxicol.51: 303-308.
Nitric acid, Lead (2+) salt	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1993. Naqvi, S.M., and R.D. Howell. Toxicity of Cadmium and Lead to Juvenile Red Swamp Crayfish, Procambarus clarkii, and Effects on Fecundity of Adults. Bull. Environ. Contam. Toxicol.51: 303-308.
Nitric acid, Lead (2+) salt	Red Swamp Crayfish	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1993. Naqvi, S.M., and R.D. Howell. Toxicity of Cadmium and Lead to Juvenile Red Swamp Crayfish, Procambarus clarkii, and Effects on Fecundity of Adults. Bull. Environ. Contam. Toxicol.51: 303-308.
Lead chloride (PbCl2)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	41		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Lead chloride (PbCl2)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	55		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Lead chloride (PbCl2)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	69		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Lead chloride (PbCl2)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	76		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Lead chloride (PbCl2)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	95		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Lead chloride (PbCl2)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	123		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Lead chloride (PbCl2)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	148		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Lead chloride (PbCl2)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	194		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead chloride (PbCl2)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	269		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Nitric acid, Lead (2+) salt	Ridged-Beak Peaclam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11400	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Nitric acid, Lead (2+) salt	Ridged-Beak Peaclam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	21300	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Nitric acid, Lead (2+) salt	Ridged-Beak Peaclam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	38000	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Nitric acid, Lead (2+) salt	River Crab	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	2700	NR	NR	ug/L	LAB	2006. Amado, E.M., C.A. Freire, and M.M. Souza. Osmoregulation and Tissue Water Regulation in the Freshwater Red Crab Dilocarcinus pagei (Crustacea, Decapoda), and the Effect of Waterborne Inorganic Lead. Aquat. Toxicol.79(1): 1-8.
Nitric acid, Lead (2+) salt	River Crab	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	2700	NR	NR	ug/L	LAB	2006. Amado, E.M., C.A. Freire, and M.M. Souza. Osmoregulation and Tissue Water Regulation in the Freshwater Red Crab Dilocarcinus pagei (Crustacea, Decapoda), and the Effect of Waterborne Inorganic Lead. Aquat. Toxicol.79(1): 1-8.
Nitric acid, Lead (2+) salt	River Crab	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	2700	NR	NR	ug/L	LAB	2006. Amado, E.M., C.A. Freire, and M.M. Souza. Osmoregulation and Tissue Water Regulation in the Freshwater Red Crab Dilocarcinus pagei (Crustacea, Decapoda), and the Effect of Waterborne Inorganic Lead. Aquat. Toxicol.79(1): 1-8.
Nitric acid, Lead (2+) salt	River Crab	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	2700	NR	NR	ug/L	LAB	2006. Amado, E.M., C.A. Freire, and M.M. Souza. Osmoregulation and Tissue Water Regulation in the Freshwater Red Crab Dilocarcinus pagei (Crustacea, Decapoda), and the Effect of Waterborne Inorganic Lead. Aquat. Toxicol.79(1): 1-8.
Nitric acid, Lead (2+) salt	River Crab	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	2700	NR	NR	ug/L	LAB	2006. Amado, E.M., C.A. Freire, and M.M. Souza. Osmoregulation and Tissue Water Regulation in the Freshwater Red Crab Dilocarcinus pagei (Crustacea, Decapoda), and the Effect of Waterborne Inorganic Lead. Aquat. Toxicol.79(1): 1-8.
Nitric acid, Lead (2+) salt	River Crab	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	2700	NR	NR	ug/L	LAB	2006. Amado, E.M., C.A. Freire, and M.M. Souza. Osmoregulation and Tissue Water Regulation in the Freshwater Red Crab Dilocarcinus pagei (Crustacea, Decapoda), and the Effect of Waterborne Inorganic Lead. Aquat. Toxicol.79(1): 1-8.
Nitric acid, Lead (2+) salt	River Crab	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	2700	NR	NR	ug/L	LAB	2006. Amado, E.M., C.A. Freire, and M.M. Souza. Osmoregulation and Tissue Water Regulation in the Freshwater Red Crab Dilocarcinus pagei (Crustacea, Decapoda), and the Effect of Waterborne Inorganic Lead. Aquat. Toxicol.79(1): 1-8.
Nitric acid, Lead (2+) salt	River Crab	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	2700	NR	NR	ug/L	LAB	2006. Amado, E.M., C.A. Freire, and M.M. Souza. Osmoregulation and Tissue Water Regulation in the Freshwater Red Crab Dilocarcinus pagei (Crustacea, Decapoda), and the Effect of Waterborne Inorganic Lead. Aquat. Toxicol.79(1): 1-8.
Nitric acid, Lead (2+) salt	River Crab	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	2700	NR	NR	ug/L	LAB	2006. Amado, E.M., C.A. Freire, and M.M. Souza. Osmoregulation and Tissue Water Regulation in the Freshwater Red Crab Dilocarcinus pagei (Crustacea, Decapoda), and the Effect of Waterborne Inorganic Lead. Aquat. Toxicol.79(1): 1-8.
Lead	Scud	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Lead	Scud	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	5000	NA	NR	ug/L	LAB	1980. Freedman, M.L., P.M. Cunningham, J.E. Schindler, and M.J. Zimmerman. Effect of Lead Speciation on Toxicity. Bull. Environ. Contam. Toxicol.25(3): 389-393.
Lead	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Nitric acid, Lead (2+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Lead	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Nitric acid, Lead (2+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Nitric acid, Lead (2+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Lead chloride (PbCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	97.3	NA	NR	nM	LAB	1996. MacLean, R.S., U. Borgmann, and D.G. Dixon. Bioaccumulation Kinetics and Toxicity of Lead in Hyalella azteca (Crustacea, Amphipoda). Can. J. Fish. Aquat. Sci.53(10): 2212-2220.
Lead chloride (PbCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	114	NA	NR	nM	LAB	1996. MacLean, R.S., U. Borgmann, and D.G. Dixon. Bioaccumulation Kinetics and Toxicity of Lead in Hyalella azteca (Crustacea, Amphipoda). Can. J. Fish. Aquat. Sci.53(10): 2212-2220.
Lead chloride (PbCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	132	NR	NR	nM	LAB	1996. MacLean, R.S., U. Borgmann, and D.G. Dixon. Bioaccumulation Kinetics and Toxicity of Lead in Hyalella azteca (Crustacea, Amphipoda). Can. J. Fish. Aquat. Sci.53(10): 2212-2220.
Nitric acid, Lead (2+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Nitric acid, Lead (2+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	175	NR	NR	ug/L	LAB	1990. Bascombe, A.D., J.B. Ellis, D.M. Revitt, and R.B.E. Shutes. The Development of Ecotoxicological Criteria in Urban Catchments. Water Sci. Technol.22(10-11): 173-179.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead chloride (PbCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	216	NA	NR	nM	LAB	1996. MacLean, R.S., U. Borgmann, and D.G. Dixon. Bioaccumulation Kinetics and Toxicity of Lead in Hyalella azteca (Crustacea, Amphipoda). Can. J. Fish. Aquat. Sci.53(10): 2212-2220.
Nitric acid, Lead (2+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	275	NA	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Nitric acid, Lead (2+) salt	Scud	Crustaceans	NR	Mortality	LD50	Not Reported	T	15000	NA	NR	ug/L	NR	1980. Zencirci, N.. Contribution to the Study of the Accumulation and Toxicity of Tin and Lead in Gammarid crustaceans. Hydrobiologia69(1/2): 179-186.
Nitric acid, Lead (2+) salt	Scud	Crustaceans	NR	Mortality	LD50	Not Reported	T	15000	NA	NR	ug/L	NR	1980. Zencirci, N.. Contribution to the Study of the Accumulation and Toxicity of Tin and Lead in Gammarid crustaceans. Hydrobiologia69(1/2): 179-186.
Lead chloride (PbCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	349	NR	NR	nmol/g	LAB	1996. MacLean, R.S., U. Borgmann, and D.G. Dixon. Bioaccumulation Kinetics and Toxicity of Lead in Hyalella azteca (Crustacea, Amphipoda). Can. J. Fish. Aquat. Sci.53(10): 2212-2220.
Lead chloride (PbCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	434	NR	NR	nmol/g	LAB	1996. MacLean, R.S., U. Borgmann, and D.G. Dixon. Bioaccumulation Kinetics and Toxicity of Lead in Hyalella azteca (Crustacea, Amphipoda). Can. J. Fish. Aquat. Sci.53(10): 2212-2220.
Lead chloride (PbCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	490	NR	NR	nmol/g	LAB	1996. MacLean, R.S., U. Borgmann, and D.G. Dixon. Bioaccumulation Kinetics and Toxicity of Lead in Hyalella azteca (Crustacea, Amphipoda). Can. J. Fish. Aquat. Sci.53(10): 2212-2220.
Lead chloride (PbCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	728	NR	NR	nmol/g	LAB	1996. MacLean, R.S., U. Borgmann, and D.G. Dixon. Bioaccumulation Kinetics and Toxicity of Lead in Hyalella azteca (Crustacea, Amphipoda). Can. J. Fish. Aquat. Sci.53(10): 2212-2220.
Lead	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2.6	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Lead	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	8.8	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Nitric acid, Lead (2+) salt	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NR	NR	ug/L	LAB	1998. Siddall, R., and B. Sures. Uptake of Lead by Pomphorhynchus laevis Cystacanths in Gammarus pulex and Immature Worms in Chub (Leuciscus cephalus). Parasitol. Res.84(7): 573-577.
Lead	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	11.6	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Lead	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	11.6	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Lead chloride (PbCl2)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	nmol/L	LAB	1999. Borgmann, U., and W.P. Norwood. Assessing the Toxicity of Lead in Sediments to Hyalella azteca: The Significance of Bioaccumulation and Dissolved Metal. Can. J. Fish. Aquat. Sci.56(8): 1494-1503.
Nitric acid, Lead (2+) salt	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Siddall, R., and B. Sures. Uptake of Lead by Pomphorhynchus laevis Cystacanths in Gammarus pulex and Immature Worms in Chub (Leuciscus cephalus). Parasitol. Res.84(7): 573-577.
Nitric acid, Lead (2+) salt	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Gerhardt, A.. Monitoring Behavioural Responses to Metals in Gammarus pulex (L.) (Crustacea) with Impedance Conversion. Environ. Sci. Pollut. Res. Int.2(1): 15-23.
Nitric acid, Lead (2+) salt	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Gerhardt, A.. Monitoring Behavioural Responses to Metals in Gammarus pulex (L.) (Crustacea) with Impedance Conversion. Environ. Sci. Pollut. Res. Int.2(1): 15-23.
Nitric acid, Lead (2+) salt	Scud	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Gerhardt, A.. Monitoring Behavioural Responses to Metals in Gammarus pulex (L.) (Crustacea) with Impedance Conversion. Environ. Sci. Pollut. Res. Int.2(1): 15-23.
Lead	Scud	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Nitric acid, Lead (2+) salt	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	53500	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Nitric acid, Lead (2+) salt	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	56500	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Lead chloride (PbCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	0.25	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Lead chloride (PbCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	25	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Lead chloride (PbCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	25	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Lead chloride (PbCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	100	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead chloride (PbCl2)	Snail	Molluscs	Fresh	Mortality	LC25	Not Reported	T	8	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Lead chloride (PbCl2)	Snail	Molluscs	Fresh	Mortality	LC25	Not Reported	T	82	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1340	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. First Q.Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 52 p..
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2540	NR	NR	ug/L	LAB	1983. Gadkari, A.S., and V.B. Marathe. Toxicity of Cadmium and Lead to a Fish and a Snail from Two Different Habitats. Indian Assoc. Water Pollut. Control Tech. Annu.5: 141-148.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	10300	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	20600	NR	NR	ug/L	LAB	1989. Mackie, G.L.. Tolerances of Five Benthic Invertebrates to Hydrogen Ions and Metals (Cd, Pb, Al). Arch. Environ. Contam. Toxicol.18(1-2): 215-223.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	190000	NR	NR	ug/L	LAB	1996. Lantataeme, S., M. Kruatruchue, S. Kaewsawangsap, Y. Chitramvong, P. Sretarugsa, and E.S. Upatham. Acute Toxicity and Bioaccumulation of Lead in the Snail, Eilopaludina (Siamopaludina) Martensi martensi (Frauenfeldt). J. Sci. Soc. Thail.22(3): 237-247.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	191690	NR	NR	ug/L	LAB	1996. Lantataeme, S., M. Kruatruchue, S. Kaewsawangsap, Y. Chitramvong, P. Sretarugsa, and E.S. Upatham. Acute Toxicity and Bioaccumulation of Lead in the Snail, Eilopaludina (Siamopaludina) Martensi martensi (Frauenfeldt). J. Sci. Soc. Thail.22(3): 237-247.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	235000	NR	NR	ug/L	LAB	1996. Lantataeme, S., M. Kruatruchue, S. Kaewsawangsap, Y. Chitramvong, P. Sretarugsa, and E.S. Upatham. Acute Toxicity and Bioaccumulation of Lead in the Snail, Eilopaludina (Siamopaludina) Martensi martensi (Frauenfeldt). J. Sci. Soc. Thail.22(3): 237-247.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	235350	NR	NR	ug/L	LAB	1996. Lantataeme, S., M. Kruatruchue, S. Kaewsawangsap, Y. Chitramvong, P. Sretarugsa, and E.S. Upatham. Acute Toxicity and Bioaccumulation of Lead in the Snail, Eilopaludina (Siamopaludina) Martensi martensi (Frauenfeldt). J. Sci. Soc. Thail.22(3): 237-247.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	270000	NR	NR	ug/L	LAB	1996. Lantataeme, S., M. Kruatruchue, S. Kaewsawangsap, Y. Chitramvong, P. Sretarugsa, and E.S. Upatham. Acute Toxicity and Bioaccumulation of Lead in the Snail, Eilopaludina (Siamopaludina) Martensi martensi (Frauenfeldt). J. Sci. Soc. Thail.22(3): 237-247.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	271030	NR	NR	ug/L	LAB	1996. Lantataeme, S., M. Kruatruchue, S. Kaewsawangsap, Y. Chitramvong, P. Sretarugsa, and E.S. Upatham. Acute Toxicity and Bioaccumulation of Lead in the Snail, Eilopaludina (Siamopaludina) Martensi martensi (Frauenfeldt). J. Sci. Soc. Thail.22(3): 237-247.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	315000	NR	NR	ug/L	LAB	1996. Lantataeme, S., M. Kruatruchue, S. Kaewsawangsap, Y. Chitramvong, P. Sretarugsa, and E.S. Upatham. Acute Toxicity and Bioaccumulation of Lead in the Snail, Eilopaludina (Siamopaludina) Martensi martensi (Frauenfeldt). J. Sci. Soc. Thail.22(3): 237-247.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	319470	NR	NR	ug/L	LAB	1996. Lantataeme, S., M. Kruatruchue, S. Kaewsawangsap, Y. Chitramvong, P. Sretarugsa, and E.S. Upatham. Acute Toxicity and Bioaccumulation of Lead in the Snail, Eilopaludina (Siamopaludina) Martensi martensi (Frauenfeldt). J. Sci. Soc. Thail.22(3): 237-247.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	100	NA	NR	ug/L	LAB	1977. Ravera, O.. Effects of Heavy Metals (Cadmium, Copper, Chromium and Lead) on a Freshwater Snail: Biomphalaria glabrata Say (Gastropoda, Prosobranchia). Malacologia16(1): 231-236.
Nitric acid, Lead (2+) salt	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	70000	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1750	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3500	NA	NR	ug/L	LAB	1976. Brown, B.E.. Observations on the Tolerance of the Isopod Asellus meridianus Rac. to Copper and Lead. Water Res.10: 555-559.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1977. Brown, B.E.. Uptake of Copper and Lead by a Metal Tolerant Isopod Asellus meridianus Rac.. Freshw. Biol.7(3): 235-244.
Nitric acid, Lead (2+) salt	Sowbug	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Brown, B.E.. Uptake of Copper and Lead by a Metal Tolerant Isopod Asellus meridianus Rac.. Freshw. Biol.7(3): 235-244.
Nitric acid, Lead (2+) salt	Stonefly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	19.2	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, Lead (2+) salt	Stonefly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Lead chloride (PbCl2)	Swan Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	2006. Lopes-Lima, M., G. Moura, B. Pratoomchat, and J. Machado. Correlation Between the Morpho-Cytohistochemistry of the Outer Mantle Epithelium of Anodonta cygnea with Seasonal Variations and Following Pollutant Exposure. Mar. Freshw. Behav. Physiol.39(3): 235-243.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	165220		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	189820		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	200450		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	334140		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	368680		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	422260		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	454760		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	484420		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	484500		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	514190		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	514190		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	552830		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	572840		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	581640		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	620142		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	723940		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	450000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	560000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	320000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nitric acid, Lead (2+) salt	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	320000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Lead	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	160000	NA	NR	ug/L	LAB	1974. See, C.L., A.L.,Jr. Buikema, and J.,Jr. Cairns. The Effects of Selected Toxicants on Survival of Dugesia tigrina (Turbellaria). ASB (Assoc. Southeast. Biol.) Bull.21(2): 82.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Not Reported	T	920	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Not Reported	T	920	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	D	8500	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	270	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	270	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead	Water Flea	Crustaceans	Fresh	Mortality	IC50	Not Reported	T	200	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2436	NR	NR	ug/L	LAB	2005. Tsui, M.T.K., W.X. Wang, and L.M. Chu. Influence of Glyphosate and Its Formulation (Roundup) on the Toxicity and Bioavailability of Metals to Ceriodaphnia dubia. Environ. Pollut.138(1): 59-68.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.26854	NA	NR	mmol/L	LAB	1995. Arambasic, M.B., S. Bjelic, and G. Subakov. Acute Toxicity of Heavy Metals (Copper, Lead, Zinc), Phenol and Sodium on Allium cepa L.., Lepidium sativum L. and Daphnia magna St.: Comparative Investigations and the Practical Applications. Water Res.29(2): 497-503.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.24	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.47	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.5	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12	NR	NR	ug/L	LAB	1999. Sankaramanachi, S.K., and S.R. Qasim. Metal Toxicity Evaluation Using Bioassay and Microtox. Int. J. Environ. Stud.56(2): 187-199.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	26.4	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29.1	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29.4	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36	NR	NR	ug/L	LAB	1999. Sankaramanachi, S.K., and S.R. Qasim. Metal Toxicity Evaluation Using Bioassay and Microtox. Int. J. Environ. Stud.56(2): 187-199.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38	NR	NR	ug/L	LAB	1999. Sankaramanachi, S.K., and S.R. Qasim. Metal Toxicity Evaluation Using Bioassay and Microtox. Int. J. Environ. Stud.56(2): 187-199.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38	NR	NR	ug/L	LAB	1999. Sankaramanachi, S.K., and S.R. Qasim. Metal Toxicity Evaluation Using Bioassay and Microtox. Int. J. Environ. Stud.56(2): 187-199.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46.1	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80.9	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	95	NR	NR	ug/L	LAB	2006. Yim, J.H., K.W. Kim, and S.D. Kim. Effect of Hardness on Acute Toxicity of Metal Mixtures Using Daphnia magna: Prediction of Acid Mine Drainage Toxicity. J. Hazard. Mater.B138(1): 16-21.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	105	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	128.2	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	168		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	168	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	187	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	208.8	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	248	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Lead(II) sulfate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	392		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Lead(II) sulfate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	395	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	444	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	517	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	520	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Lead	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	530	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	530	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	755	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	843	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	894	NR	NR	ug/L	LAB	2006. Yim, J.H., K.W. Kim, and S.D. Kim. Effect of Hardness on Acute Toxicity of Metal Mixtures Using Daphnia magna: Prediction of Acid Mine Drainage Toxicity. J. Hazard. Mater.B138(1): 16-21.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1120	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1580	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1700	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1800	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2300	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3900	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Lead	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4400	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Lead	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4500	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Lead	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5100	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5500	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7800	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8600	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9900	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13000	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	167000	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Lead(II) sulfate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3166000	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2300*	NA	NR	ug/L	LAB	1986. Ziegenfuss, P.S., W.J. Renaudette, and W.J. Adams. Methodology for Assessing the Acute Toxicity of Chemicals Sorbed to Sediments: Testing the Equilibrium Partitioning Theory. In: T.M.Poston and R.Purdy (Eds.), Aquatic Toxicology and Environmental Fate, 9th Volume, ASTM STP 921, Philadelphia, PA: 479-493.
Lead chloride (PbCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	330	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Lead chloride (PbCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead chloride (PbCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	6300	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Lead chloride (PbCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Lead chloride (PbCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	16400	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	17.9	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Lead	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	170	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	250	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Lead	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	340	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	450	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	2400	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	14000	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	20	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	20	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	20	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	40	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	45	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	140	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Lead	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	226	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	250	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	9	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Lead	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	99	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Lead	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	150	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Bodar, C.W.M., A.V.D. Zee, P.A. Voogt, H. Wynne, and D.I. Zandee. Toxicity of Heavy Metals to Early Life Stages of Daphnia magna. Ecotoxicol. Environ. Saf.17(3): 333-338.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	4.5	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	5.1	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	100	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	4.5	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Lead	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	99	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Lead	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	340	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	900	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	900	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	900	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	60	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Lead	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	71	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Lead	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	107	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	110	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	110	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	110	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	2.1	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Lead	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	51	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Lead	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	150	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	260	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	260	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	260	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	270	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.

Table B-14. Summary of Results from the EcoTox Database for Invertebrates - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	920	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Lead chloride (PbCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Enserink, E.L., M.J.J. Kerkhofs, C.A.M. Baltus, and J.H. Koeman. Influence of Food Quantity and Lead Exposure on Maturation in Daphnia magna; Evidence for a Trade-Off Mechanism. Funct. Ecol.9(2): 175-185.
Nitric acid, Lead (2+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nitric acid, Lead (2+) salt	Zebra Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	85	NA	NR	ug/L	LAB	Mudgall and Patil 1988. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Lead (2+) salt	Zebra Mussel	Molluscs	Fresh	Growth	NR	Soft Tissue	T	358	NA	NR	ug/L	LAB	Birge 1978; Birge et al. 1979. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Lead (2+) salt	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	497	NA	NR	ug/L	LAB	Birge et al. 1978; EPA 1995. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Lead (2+) salt	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2330	NA	NR	ug/L	LAB	Kaplan et al. 1967. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Lead (2+) salt	Zebra Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to *Hyalella azteca* at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

Table B-15. Summary of Results from the EcoTox Database for Invertebrates - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Manganese	Amphipod	Crustaceans	Fresh	Mortality	LC50		AM	2729			ug/L	LAB	. . . .
Manganese chloride (MnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	17000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Manganese chloride (MnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	18000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Manganese chloride (MnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	28000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Manganese chloride (MnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	34000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Manganese chloride (MnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	36000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Manganese chloride (MnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	51000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Manganese chloride (MnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	51000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Manganese chloride	Freshwater Sponge	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	mM	LAB	1978. Ostrom, K.M., and T.L. Simpson. Calcium and the Release From Dormancy of Freshwater Sponge Gemmules. Dev. Biol.64: 332-338.
Manganese chloride	Freshwater Sponge	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	1	NA	NR	mM	LAB	1978. Ostrom, K.M., and T.L. Simpson. Calcium and the Release From Dormancy of Freshwater Sponge Gemmules. Dev. Biol.64: 332-338.
Sulfuric acid, Manganese(2+) salt	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1983. Rao, S.V.R., and K.J. Nath. Biological Effect of Some Poisons on Canthocamptus (Crustacea spp). Int. J. Environ. Stud.21(3-4): 271-275.
Sulfuric acid, Manganese(2+) salt	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	250	NA	NR	ug/L	LAB	1983. Rao, S.V.R., and K.J. Nath. Biological Effect of Some Poisons on Canthocamptus (Crustacea spp). Int. J. Environ. Stud.21(3-4): 271-275.
Sulfuric acid, Manganese(2+) salt	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	150	NA	NR	ug/L	LAB	1983. Rao, S.V.R., and K.J. Nath. Biological Effect of Some Poisons on Canthocamptus (Crustacea spp). Int. J. Environ. Stud.21(3-4): 271-275.
Manganese	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese chloride (MnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	307	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.

Table B-15. Summary of Results from the EcoTox Database for Invertebrates - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Manganese chloride (MnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	12400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Manganese chloride (MnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.

Table B-15. Summary of Results from the EcoTox Database for Invertebrates - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Manganese chloride (MnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride (MnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4360	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5800	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5800	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6320	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6320	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6320	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7180	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.

Table B-15. Summary of Results from the EcoTox Database for Invertebrates - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Manganese chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7180	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Sulfuric acid, Manganese(2+) salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	55	NR	NR	ug/L	LAB	1997. Fargasova, A.. Sensitivity of Chironomus plumosus Larvae to V5+, Mo6+, Mn2+, Ni2+, Cu2+, and Cu+ Metal Ions and Their Combinations. Bull. Environ. Contam. Toxicol.59(1): 956-962.
Sulfuric acid, Manganese(2+) salt (1:1)	Midge	Insects/Spiders	NR	Mortality	NR	Not Reported	T	27000*	NA	NR	ug/L	LAB	1981. Rao, D.S., and A.B. Saxena. Acute Toxicity of Mercury, Zinc, Lead, Cadmium, Manganese to the Chironomus sp. Int. J. Environ. Stud.16(3-4): 225-226.
Sulfuric acid, Manganese(2+) salt (1:1)	Midge	Insects/Spiders	NR	Mortality	NR	Not Reported	T	27000*	NA	NR	ug/L	LAB	1981. Rao, D.S., and A.B. Saxena. Acute Toxicity of Mercury, Zinc, Lead, Cadmium, Manganese to the Chironomus sp. Int. J. Environ. Stud.16(3-4): 225-226.
Manganese	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	1000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	132	L	108	mM	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Manganese chloride	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	97.9	L	76.1	mmol/L	LAB	1997. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Predicting Relative Metal Toxicity with Ion Characteristics: Caenorhabditis elegans LC50. Aquat. Toxicol.39(3-4): 279-290.
Sulfuric acid, Manganese(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	NOEC	Not Reported	T	800000	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Sulfuric acid, Manganese(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Sulfuric acid, Manganese(2+) salt (1:1)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Jaworska, M., J. Sepiol, and P. Tomasik. Effect of Metal Ions Under Laboratory Conditions on the Entomopathogenic Steinernema carpocapsae (Rhabditida: Steinernematidae). Water Air Soil Pollut.88(3-4): 331-341.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Growth	LOEC	Not Reported	T	84100	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Growth	NOEC	Not Reported	T	8409	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC5	Not Reported	T	5759700	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC5	Not Reported	T	7181500	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC5	Not Reported	T	6596200	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC5	Not Reported	T	2867600	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	28915000	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	19154000	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	14011000	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8409000	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC95	Not Reported	T	1.45E+08	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC95	Not Reported	T	51087000	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.

Table B-15. Summary of Results from the EcoTox Database for Invertebrates - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC95	Not Reported	T	29763000	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Periwinkle	Molluscs	Fresh	Mortality	LC95	Not Reported	T	24659000	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Manganese chloride (MnCl2)	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	700000	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Manganese nitrate	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	660000	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Manganese chloride (MnCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	148000	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Manganese chloride (MnCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	146000	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Manganese	Quiver Fly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	2000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese chloride (MnCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	38700	NA	NR	ug/L	LAB	1989. Couillard, Y., P. Ross, and B. Pinel-Alloul. Acute Toxicity of Six Metals to the Rotifer Brachionus calyciflorus, with Comparisons to Other Freshwater Organisms. Toxic. Assess.4(4): 451-462.
Manganese	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2769	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Manganese	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	70000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese chloride (MnCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Sulfuric acid, Manganese(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Mostafa, B.B.. Effect of Certain Salts on Biomphalaria alexandrina Snails and Their Susceptibility to Schistosoma mansoni Infection. Egypt. J. Bilharz.19: 75-88.
Sulfuric acid, Manganese(2+) salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Mostafa, B.B.. Effect of Certain Salts on Biomphalaria alexandrina Snails and Their Susceptibility to Schistosoma mansoni Infection. Egypt. J. Bilharz.19: 75-88.
Manganese chloride (MnCl2)	Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	100000	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Sulfuric acid, Manganese(2+) salt (1:1)	Trematode Parasite	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Mostafa, B.B.. Effect of Certain Salts on Biomphalaria alexandrina Snails and Their Susceptibility to Schistosoma mansoni Infection. Egypt. J. Bilharz.19: 75-88.
Sulfuric acid, Manganese(2+) salt (1:1)	Trematode Parasite	Worms	Fresh	Reproduction	NOEC	Not Reported	T	300000	NR	NR	ug/L	LAB	1997. Mostafa, B.B.. Effect of Certain Salts on Biomphalaria alexandrina Snails and Their Susceptibility to Schistosoma mansoni Infection. Egypt. J. Bilharz.19: 75-88.
Sulfuric acid, Manganese(2+) salt (1:1)	Trematode Parasite	Worms	Fresh	Reproduction	NOEC	Not Reported	T	300000	NR	NR	ug/L	LAB	1997. Mostafa, B.B.. Effect of Certain Salts on Biomphalaria alexandrina Snails and Their Susceptibility to Schistosoma mansoni Infection. Egypt. J. Bilharz.19: 75-88.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	179700		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	319500		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	422360		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	567030		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	171410		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	293080		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.

Table B-15. Summary of Results from the EcoTox Database for Invertebrates - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	294260		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	350160		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	171410		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	273020		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	275700		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	293080		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	164550		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	239270		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	239390		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	275700		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	768	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	429	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	295	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Manganese	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	700000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	320000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	560000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	100000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	180000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	180000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Manganese(2+) salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	180000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Manganese chloride (MnCl2)	Turbellarian, Flatworm	Worms	Fresh	Mortality	NR	Not Reported	T	200000*	NA	NR	ug/L	LAB	1980. Palladini, G., V. Margotta, A. Carolei, and M.C. Hernandez. Dopamine Agonist Performance in Planaria After Manganese Treatment. Experientia36(4): 449-450.
Sulfuric acid, Manganese(2+) salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	NR	Not Reported	T	300000*	NA	NR	ug/L	LAB	1980. Palladini, G., V. Margotta, A. Carolei, and M.C. Hernandez. Dopamine Agonist Performance in Planaria After Manganese Treatment. Experientia36(4): 449-450.

Table B-15. Summary of Results from the EcoTox Database for Invertebrates - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Manganese chloride (MnCl2)	Turbellarian, Flatworm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	360000*	NA	NR	ug/L	LAB	1980. Palladini, G., V. Margotta, A. Carolei, and M.C. Hernandez. Dopamine Agonist Performance in Planaria After Manganese Treatment. Experientia36(4): 449-450.
Sulfuric acid, Manganese(2+) salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	3040000*	NA	NR	ug/L	LAB	1980. Palladini, G., V. Margotta, A. Carolei, and M.C. Hernandez. Dopamine Agonist Performance in Planaria After Manganese Treatment. Experientia36(4): 449-450.
Manganese chloride (MnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	56000	NA	NR	ug/L	LAB	1996. Sorvari, J., and M. Sillanpaa. Influence of Metal Complex Formation on Heavy Metal and Free EDTA and DTPA Acute Toxicity Determined by Daphnia magna. Chemosphere33(6): 1119-1127.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15200	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19200	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8990	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12600	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14400	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Manganese chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	533	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Manganese chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	703	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Manganese chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	308	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Manganese chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	363	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	90900	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	42200	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	23800	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	24600	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	21000	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Manganese chloride (MnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	60000	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.

Table B-15. Summary of Results from the EcoTox Database for Invertebrates - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Manganese chloride (MnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	31100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Manganese chloride (MnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	5200	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1100	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	7700	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	5500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	3900	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Manganese chloride (MnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Van Dam, R.A., M.J. Barry, J.T. Ahokas, and D.A. Holdway. Investigating Mechanisms of Diethylenetriamine Pentaacetic Acid Toxicity to the Cladoceran, Daphnia carinata. Aquat. Toxicol.46(3): 191-210.
Sulfuric acid, Manganese(2+) salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1997. Pantani, C., G. Pannunzio, M. De Cristofaro, A.A. Novelli, and M. Salvatori. Comparative Acute Toxicity of Some Pesticides, Metals, and Surfactants to Gammarus italicus Goedm. and Echinogammarus tibaldii Pink. and Stock (Crustacea: Amphipoda). Bull. Environ. Contam. Toxicol.59(6): 963-967.
Mercury	Amphipod	Crustaceans	Fresh	Mortality	LC50		AM	2.1			ug/L	LAB	. . . .
Mercury chloride (HgCl2)	Annelid Worm Class	Worms	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Effects of Species Interactions on the Survival and Respiration of Limnodrilus hoffmeisteri and Tubifex tubifex (Oligochaeta, Tubificidae) Exposed to Various Pollutants and Enironmental Factors. Water Res.16(9): 1405-1408.
Mercury chloride (HgCl2)	Apple Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4467	NA	NR	ug/L	LAB	1991. Sivaramakrishna, B., K. Radhakrishnaiah, and A. Suresh. Assessment of Mercury Toxicity by the Changes in Oxygen Consumption and Ion Levels in the Freshwater Snail, Pila globosa, and the Mussel, Lamellidens. Bull. Environ. Contam. Toxicol.46: 913-920.
Mercury chloride (HgCl2)	Apple Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4467	NA	NR	ug/L	LAB	1991. Sivaramakrishna, B., K. Radhakrishnaiah, and A. Suresh. Assessment of Mercury Toxicity by the Changes in Oxygen Consumption and Ion Levels in the Freshwater Snail, Pila globosa, and the Mussel, Lamellidens. Bull. Environ. Contam. Toxicol.46: 913-920.
Mercury chloride (HgCl2)	Apple Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4477	NA	NR	ug/L	LAB	1991. Sivaramakrishna, B., K. Radhakrishnaiah, and A. Suresh. Assessment of Mercury Toxicity by the Changes in Oxygen Consumption and Ion Levels in the Freshwater Snail, Pila globosa, and the Mussel, Lamellidens. Bull. Environ. Contam. Toxicol.46: 913-920.
Mercury chloride (HgCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	148*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercuric nitrate	Banded Mystery Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	T	48.2	NR	NR	ug/L	LAB	1994. Tessier, L., G. Vaillancourt, and L. Pazdernik. Comparative Study of the Cadmium and Mercury Kinetics Between the Short-Lived Gastropod Viviparus georgianus (lea) and Pelecypod Elliptio complanata (lightfoot), Under Laboratory Conditions. Environ. Pollut.85: 271-282.
Mercuric nitrate	Banded Mystery Snail	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Tessier, L., G. Vaillancourt, and L. Pazdernik. Laboratory Study of Cd and Hg Uptake by Two Freshwater Molluscs in Relation to Concentration, Age and Exposure Time. Water Air Soil Pollut.86(1-4): 347-357.
Mercuric nitrate	Banded Mystery Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Tessier, L., G. Vaillancourt, and L. Pazdernik. Laboratory Study of Cd and Hg Uptake by Two Freshwater Molluscs in Relation to Concentration, Age and Exposure Time. Water Air Soil Pollut.86(1-4): 347-357.
Mercury chloride (HgCl2)	Beet Nematode	Worms	Fresh	Growth	NOEL	Whole Organism	T	10000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Mercury chloride (HgCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	4330		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Mercury chloride (HgCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	5110		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Mercury chloride (HgCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	3080		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Mercury chloride (HgCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	3280		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Mercury chloride (HgCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2300		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Mercury chloride (HgCl2)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2810		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Mercury chloride (HgCl2)	Beet Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Mercury chloride (HgCl2)	Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1.57	NA	NR	ug/L	LAB	1986. Abraham, T.J., K.Y.M. Salih, and J. Chacko. Effects of Heavy Metals on the Filtration Rate of Bivalve Villorita cyprinoides (Hanley) var. cochinensis. Indian J. Mar. Sci.15(3): 195-196.
Mercury chloride (HgCl2)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	40		NC	ug/L	LAB	1998. Safadi, R.S.. The Use of Freshwater Planarians in Acute Toxicity Tests with Heavy Metals. Verh. Int. Ver. Limnol.26(5): 2391-2392.
Mercury chloride (HgCl2)	Caddisfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Mercury	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	5600	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	1200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury chloride (HgCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	17.5	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Mercury chloride (HgCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Mercury chloride (HgCl2)	Ciliate	Invertebrates	Fresh	Mortality	LETC	Not Reported	T	3340*	NA	NR	ug/L	LAB	1973. Carter, J.W., and I.L. Cameron. Toxicity Bioassay of Heavy Metals in Water Using Tetrahymena-pyriformis. Water Res.7(7): 951-961.
Mercury chloride (HgCl2)	Ciliate	Invertebrates	Fresh	Mortality	LETC	Not Reported	T	3340*	NA	NR	ug/L	LAB	1973. Carter, J.W., and I.L. Cameron. Toxicity Bioassay of Heavy Metals in Water Using Tetrahymena-pyriformis. Water Res.7(7): 951-961.
Mercury chloride (HgCl2)	Ciliated Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	4	NR	NR	ug/L	LAB	1998. Twagilimana, L., J. Bohatier, CA Groliere, F. Bonnemoy, and D. Sargos. A New Low-Cost Microbiotest with the Protozoan Spirostomum teres: Culture Conditions and Assessment of Sensitivity of the Ciliate to 14 Pure Chemicals. Ecotoxicol. Environ. Saf.41(3): 231-244.
Mercury chloride (HgCl2)	Ciliated Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5.94	NA	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Mercury chloride (HgCl2)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	620	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Mercury chloride (HgCl2)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Mercury chloride (HgCl2)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Mercury chloride (HgCl2)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Mercury chloride (HgCl2)	Common Bay Mussel,Blue Mussel	Molluscs	NR	Mortality	NR	Not Reported	T	750	NA	NR	ug/L	LAB	1980. Breittmayer, J.P., R. Guido, and S. Tuncer. The Effect of Cadmium on the Toxicity of Mercury to the Mussel Mytilus edulis (L.). Chemosphere9(11): 725-728.
Mercury chloride (HgCl2)	Common Rangia Or Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	242	NA	NR	ug/L	LAB	1977. Dillon, T.M.. Mercury and the Estuarine Marsh Clam, Rangia cuneata Gray. I. Toxicity. Arch. Environ. Contam. Toxicol.6(2/3): 249-255.
Mercury chloride (HgCl2)	Common Rangia Or Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	122	NA	NR	ug/L	LAB	1977. Dillon, T.M.. Mercury and the Estuarine Marsh Clam, Rangia cuneata Gray. I. Toxicity. Arch. Environ. Contam. Toxicol.6(2/3): 249-255.
Mercury chloride (HgCl2)	Common Rangia Or Clam	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	6300	NA	NR	ug/L	LAB	1973. Olson, K.R., and R.C. Harrel. Effect of Salinity on Acute Toxicity of Mercury, Copper, and Chromium for Rangia cuneata (Pelecypoda, Mactridae). Contrib. Mar. Sci17: 9-13.
Mercury chloride (HgCl2)	Common Rangia Or Clam	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	5500	NA	NR	ug/L	LAB	1973. Olson, K.R., and R.C. Harrel. Effect of Salinity on Acute Toxicity of Mercury, Copper, and Chromium for Rangia cuneata (Pelecypoda, Mactridae). Contrib. Mar. Sci17: 9-13.
Mercury chloride (HgCl2)	Common Rangia Or Clam	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	5100	NA	NR	ug/L	LAB	1973. Olson, K.R., and R.C. Harrel. Effect of Salinity on Acute Toxicity of Mercury, Copper, and Chromium for Rangia cuneata (Pelecypoda, Mactridae). Contrib. Mar. Sci17: 9-13.
Mercury chloride (HgCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Mercury chloride (HgCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	32	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Mercury chloride (HgCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	NR	Not Reported	T	56	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Mercury chloride (HgCl2)	Copepod Subclass	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	160	NA	NR	ug/L	LAB	1980. Borgmann, U., R. Cove, and C. Loveridge. Effect of Metals on the Biomass Production Kinetics of Freshwater Copepods. Can. J. Fish. Aquat. Sci.37(4): 567-575.
Mercury chloride (HgCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1992. Amte, G.K., and K.B. Sawant. Acute Toxicity of Inorganic Mercury to Estuarine Crab Ilyoplax gangetica (Kemp). Pollut. Res.12(1): 29-34.
Mercury chloride (HgCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1992. Amte, G.K., and K.B. Sawant. Acute Toxicity of Inorganic Mercury to Estuarine Crab Ilyoplax gangetica (Kemp). Pollut. Res.12(1): 29-34.
Mercury chloride (HgCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1992. Amte, G.K., and K.B. Sawant. Acute Toxicity of Inorganic Mercury to Estuarine Crab Ilyoplax gangetica (Kemp). Pollut. Res.12(1): 29-34.
Mercury chloride (HgCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1992. Amte, G.K., and K.B. Sawant. Acute Toxicity of Inorganic Mercury to Estuarine Crab Ilyoplax gangetica (Kemp). Pollut. Res.12(1): 29-34.
Mercury chloride (HgCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	370.4	NA	NR	ug/L	LAB	1990. Ananthalakshmikumari, K.V.V., K. Shyamasundari, and K.H. Rao. Toxicity of Mercury to the Freshwater Male and Female Field Crabs, Paratelphusa hydrodromous (Herbst) (Decapoda: Brachyura). Bull. Environ. Contam. Toxicol.45(6): 900-906.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	410.8	NA	NR	ug/L	LAB	1990. Ananthalakshmikumari, K.V.V., K. Shyamasundari, and K.H. Rao. Toxicity of Mercury to the Freshwater Male and Female Field Crabs, Paratelphusa hydrodromous (Herbst) (Decapoda: Brachyura). Bull. Environ. Contam. Toxicol.45(6): 900-906.
Mercury chloride (HgCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	349.3	NA	NR	ug/L	LAB	1990. Ananthalakshmikumari, K.V.V., K. Shyamasundari, and K.H. Rao. Toxicity of Mercury to the Freshwater Male and Female Field Crabs, Paratelphusa hydrodromous (Herbst) (Decapoda: Brachyura). Bull. Environ. Contam. Toxicol.45(6): 900-906.
Mercury chloride (HgCl2)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	377.3	NA	NR	ug/L	LAB	1990. Ananthalakshmikumari, K.V.V., K. Shyamasundari, and K.H. Rao. Toxicity of Mercury to the Freshwater Male and Female Field Crabs, Paratelphusa hydrodromous (Herbst) (Decapoda: Brachyura). Bull. Environ. Contam. Toxicol.45(6): 900-906.
Mercury chloride (HgCl2)	Crab	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Lanzer-DeSouza, M.E., and N.M.M. Dasilva. Influence of Pollutants on Aquatic Crustaceans Decapoda palaemonidae. Iheringia Ser. Misc.2: 13-30.
Mercury chloride (HgCl2)	Crab	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1990. Ananthalakshmikumari, K.V.V., K. Shyamasundari, and K.H. Rao. Toxicity of Mercury to the Freshwater Male and Female Field Crabs, Paratelphusa hydrodromous (Herbst) (Decapoda: Brachyura). Bull. Environ. Contam. Toxicol.45(6): 900-906.
Mercury chloride (HgCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17300	NR	NR	ug/L	LAB	1995. Abdelghani, A.A., Y.V. Pramar, T.K. Mandal, P.B. Tchounwou, and L. Heyer. Levels and Toxicities of Selected Inorganic and Organic Contaminants in a Swamp Environment. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes30(5): 717-731.
Mercury chloride (HgCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	1995. Abdelghani, A.A., Y.V. Pramar, T.K. Mandal, P.B. Tchounwou, and L. Heyer. Levels and Toxicities of Selected Inorganic and Organic Contaminants in a Swamp Environment. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes30(5): 717-731.
Mercury chloride (HgCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	2	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Mercury chloride (HgCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	20	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Mercury chloride (HgCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	2	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Mercury chloride (HgCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	50	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Mercury chloride (HgCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC60	Not Reported	T	1000	NA	NR	ug/L	LAB	1976. Doyle, M., S. Koepp, and J. Klaunig. Acute Toxicological Response of the Crayfish (Orconectes limosus) to Mercury. Bull. Environ. Contam. Toxicol.16(4): 422-424.
Mercury	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1988. Abbasi, S.A., P.C. Nipaney, and R. Soni. Studies on Environmental Management of Mercury (II), Chromium (VI) and Zinc (II) with Respect to the Impact on Some Arthropods and Protozoans - Toxicity of Zinc (II). Int. J. Environ. Stud.32: 181-187.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33.092	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	42.319	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	62.343	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	79.498	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21.033	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36.913	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52.469	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70.359	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11.856	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32.119	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	42.6	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	62.696	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	27.165	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32.788	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	54.71	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Sulfuric acid, Mercury(2+) salt(1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.702	NR	NR	ug/L	LAB	2006. Chaudhary, P., and A.K. Gupta. Impact of Water Hardness and Temperature on the Acute Toxicity of Copper and Mercury to a Freshwater Copepod, Cyclops. Indian J. Environ. Sci.10(2): 139-143.
Mercury chloride (HgCl2)	Daggerblade Grass Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1986. Kraus, M.L.. Differences in Tolerance to Mercury Between Two Populations of the Grass Shrimp Palaemonetes pugio. Diss. Abstr. Int. B Sci. Eng. 47(11):4398B (1987) / Ph. D. Thesis, Rutgers University, New Brunswick, NJ(): -.
Methyl mercury(1+), Ion	Daggerblade Grass Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	12.5	NA	NR	ug/L	LAB	1986. Kraus, M.L.. Differences in Tolerance to Mercury Between Two Populations of the Grass Shrimp Palaemonetes pugio. Diss. Abstr. Int. B Sci. Eng. 47(11):4398B (1987) / Ph. D. Thesis, Rutgers University, New Brunswick, NJ(): -.
Methyl mercury(1+), Ion	Daggerblade Grass Shrimp	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	12.5	NA	NR	ug/L	LAB	1986. Kraus, M.L.. Differences in Tolerance to Mercury Between Two Populations of the Grass Shrimp Palaemonetes pugio. Diss. Abstr. Int. B Sci. Eng. 47(11):4398B (1987) / Ph. D. Thesis, Rutgers University, New Brunswick, NJ(): -.
Mercury chloride (HgCl2)	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7613*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercury	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	3200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	1200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	21	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	29	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC10		T	26	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	47	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	86	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC20		T	52	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	221	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	683	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Duckweed	Flowers, Trees, Shrubs, Ferns	Fresh	Growth	EC50		T	191	NR	NR	ug/L	LAB	2007. Naumann, B., M. Eberius, and K.J. Appenroth. Growth Rate Based Dose-Response Relationships and EC-Values of Ten Heavy Metals Using the Duckweed Growth Inhibition Test (ISO 20079) with Lemna minor L. Clone St. J. Plant Physiol.164(12): 1656-1664.
Mercury chloride (HgCl2)	Earthworm	Worms	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.4	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.
Mercury chloride (HgCl2)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Mercury chloride (HgCl2)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	64	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Mercury chloride (HgCl2)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1995. Centeno, M.D.F., G. Persoone, and M.P. Goyvaerts. Cyst-Based Toxicity Tests. IX. The Potential of Thamnocephalus platyurus as Test Species in Comparison with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca). Environ. Toxicol. Water Qual.10(4): 275-282.
Mercury chloride (HgCl2)	Fleshy Prawn	Crustaceans	NR	Mortality	LC50	Not Reported	T	0.00151	NA	NR	ug/L	LAB	1990. Chen, B., and M. Chen. Acute Toxicity of Arsenic, Phenol, Mercury and Chromium to the Larvae of Penaeus orientali. Mar. Sci.14(3): 51-53.
Mercury chloride (HgCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	4766.5		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Mercury chloride (HgCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	3195.2		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Mercury chloride (HgCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	1358		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Mercury chloride (HgCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	395		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Mercury chloride (HgCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8102.1		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Mercury chloride (HgCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5889.7		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Mercury chloride (HgCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3887.2		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Mercury chloride (HgCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	953.5		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Mercury chloride (HgCl2)	Fresh-Water Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Zarnescu, O., V. Manolache, and C. Tesio. Effects of Mercuric Chloride Exposure in the Foot of Anodonta piscinalis (Nilsson). Histopathological and Histochemical Features. Rev. Roum. Biol. Biol. Anim.41(1): 35-44.
Mercury	Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.12	NA	NR	ug/L	LAB	1985. Sarojini, R., and B. Victor. Toxicity of Mercury on the Ovaries of the Caridean Prawn, Caridina rajadhari (Bouvier). Curr. Sci. (Bangalore)54(8): 398-400.
Mercury	Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.918	NA	NR	ug/L	LAB	1985. Sarojini, R., and B. Victor. Toxicity of Mercury on the Ovaries of the Caridean Prawn, Caridina rajadhari (Bouvier). Curr. Sci. (Bangalore)54(8): 398-400.
Mercury	Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5.784	NA	NR	ug/L	LAB	1985. Sarojini, R., and B. Victor. Toxicity of Mercury on the Ovaries of the Caridean Prawn, Caridina rajadhari (Bouvier). Curr. Sci. (Bangalore)54(8): 398-400.
Mercury	Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.786	NA	NR	ug/L	LAB	1985. Sarojini, R., and B. Victor. Toxicity of Mercury on the Ovaries of the Caridean Prawn, Caridina rajadhari (Bouvier). Curr. Sci. (Bangalore)54(8): 398-400.
Mercury chloride (HgCl2)	Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52.75	NA	NR	ug/L	LAB	1984. Ghate, H.V.. Gill Melanization and Heavy Metals in Freshwater Prawns. Indian J. Fish.31(3): 389-393.
Mercury chloride (HgCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Mercury chloride (HgCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	810	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Mercury chloride (HgCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	451*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercury chloride	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46		NC	ug/L	LAB	1982. Bengtsson, B.E., and B. Bergstrom. Toxicity Tests with Nitocra spinipes (Crustacea) and Some Metals Released from a Smelter Industry. In: K.Muller (Ed.), Coastal Research in the Gulf of Bothnia, Chapter 33, Dr.W.Junk Publ., The Hague, Netherlands:439-444 / Chem.Abstr.97: 439-444.
Mercury chloride (HgCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	103	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Mercury chloride (HgCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	56.2*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercury chloride (HgCl2)	Jumbo Tiger Prawn	Crustaceans	NR	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Veena, K.M., and N.L. Ammal. Effect of Differential Concentration of Mercury on Shrimp Penaeus monodon and the Subsequent Bioaccumulation. Aquat. Sci. Fish. Abstr. 14(10, Pt. 1):239 (1984) / Seafood Export J.15(6): 15-18.
Mercury chloride (HgCl2)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	237*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercury	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury chloride (HgCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Mayfly	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Odin, M., A. Feurtet-Mazel, F. Ribeyre, and A. Boudou. Inorganic Mercury and Methylmercury Bioaccumulation by Nymphs of the Burrowing Mayfly Hexagenia rigida from the Water Column as the Initial. Toxicol. Environ. Chem.48: 213-244.
Mercury chloride (HgCl2)	Mayfly	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	30	NA	NR	ug/d	LAB	1993. Saouter, E., L. Hare, P.G.C. Campbell, A. Boudou, and F. Ribeyre. Mercury Accumulation in the Burrowing Mayfly Hexagenia rigida (Ephemeroptera) Exposed to CH3HgCl or HgCl2 in Water and Sediment. Water Res.27(6): 1041-1048.
Mercury chloride (HgCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	37.0*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercury chloride (HgCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Mercury chloride (HgCl2)	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Odin, M., A. Feurtet-Mazel, F. Ribeyre, and A. Boudou. Inorganic Mercury and Methylmercury Bioaccumulation by Nymphs of the Burrowing Mayfly Hexagenia rigida from the Water Column as the Initial. Toxicol. Environ. Chem.48: 213-244.
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	2430	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	3180	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	3230	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1280	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1760	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1360	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	880	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1050	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	600	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	880	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1690	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1960	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	4800	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	750	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	240	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	790	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	820	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	230	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	260	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	710	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	220	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	230	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	480	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	2280	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	23400	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	29600	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	32300	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	6700	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	6860	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	8040	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	3040	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	570	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	580	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	240	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	280	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	570	NA	NR	ug/L	LAB	1989. Hooftman, R.N., D.M.M. Adema, and J. Kauffman-Van Bommel. Developing a Set of Test Methods for the Toxicological Analysis of the Pollution Degree of Waterbottoms. Rep.No.16105, Netherlands Organization for Applied Scientific Research: 68 p..
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1330	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1330	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1330	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1330	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1590	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1590	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2540	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	25600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	25600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	34000	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	34000	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	34000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	34000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	34100	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	34100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	34100	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	34100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	37100	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	37100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42200	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42200	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1074	NA	NR	ug/L	LAB	1986. Rossaro, B., G.F. Gaggino, and R. Marchetti. Accumulation of Mercury in Larvae and Adults, Chironomus riparius (Meigen). Bull. Environ. Contam. Toxicol.37(3): 402-406.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1028	NA	NR	ug/L	LAB	1986. Rossaro, B., G.F. Gaggino, and R. Marchetti. Accumulation of Mercury in Larvae and Adults, Chironomus riparius (Meigen). Bull. Environ. Contam. Toxicol.37(3): 402-406.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	316	NA	NR	ug/L	LAB	1986. Rossaro, B., G.F. Gaggino, and R. Marchetti. Accumulation of Mercury in Larvae and Adults, Chironomus riparius (Meigen). Bull. Environ. Contam. Toxicol.37(3): 402-406.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1986. Rossaro, B., G.F. Gaggino, and R. Marchetti. Accumulation of Mercury in Larvae and Adults, Chironomus riparius (Meigen). Bull. Environ. Contam. Toxicol.37(3): 402-406.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	407*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1986. Rossaro, B., G.F. Gaggino, and R. Marchetti. Accumulation of Mercury in Larvae and Adults, Chironomus riparius (Meigen). Bull. Environ. Contam. Toxicol.37(3): 402-406.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	547	NA	NR	ug/L	LAB	1986. Rossaro, B., G.F. Gaggino, and R. Marchetti. Accumulation of Mercury in Larvae and Adults, Chironomus riparius (Meigen). Bull. Environ. Contam. Toxicol.37(3): 402-406.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2780*	NA	NR	ug/L	LAB	1986. Ziegenfuss, P.S., W.J. Renaudette, and W.J. Adams. Methodology for Assessing the Acute Toxicity of Chemicals Sorbed to Sediments: Testing the Equilibrium Partitioning Theory. In: T.M.Poston and R.Purdy (Eds.), Aquatic Toxicology and Environmental Fate, 9th Volume, ASTM STP 921, Philadelphia, PA: 479-493.
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	60	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	20	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	3500	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury chloride (HgCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	7391*	NA	NR	ug/L	LAB	1981. Rao, D.S., and A.B. Saxena. Acute Toxicity of Mercury, Zinc, Lead, Cadmium, Manganese to the Chironomus sp. Int. J. Environ. Stud.16(3-4): 225-226.
Mercury	Mussel	Molluscs	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1991. Raj, A.I.M., and P.S. Hameed. Effect of Copper, Cadmium and Mercury on Metabolism of the Freshwater Mussel Lamellidens marginalis (Lamarck). J. Environ. Biol.12(2): 131-135.
Mercury	Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	0.0045	NR	NR	ug/L	FIELDN	1996. Malley, D.F., A.R. Stewart, and B.D. Hall. Uptake of Methyl Mercury by the Floater Mussel, Pyganodon grandis (Bivalvia, Unionidae), Caged in a Flooded Wetland. Environ. Toxicol. Chem.15(6): 928-936.
Mercury	Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	0.0033	NR	NR	ug/L	FIELDN	1996. Malley, D.F., A.R. Stewart, and B.D. Hall. Uptake of Methyl Mercury by the Floater Mussel, Pyganodon grandis (Bivalvia, Unionidae), Caged in a Flooded Wetland. Environ. Toxicol. Chem.15(6): 928-936.
Methyl mercury(1+), Ion	Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	0.00024	NR	NR	ug/L	FIELDN	1996. Malley, D.F., A.R. Stewart, and B.D. Hall. Uptake of Methyl Mercury by the Floater Mussel, Pyganodon grandis (Bivalvia, Unionidae), Caged in a Flooded Wetland. Environ. Toxicol. Chem.15(6): 928-936.
Methyl mercury(1+), Ion	Mussel	Molluscs	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	FIELDN	1996. Malley, D.F., A.R. Stewart, and B.D. Hall. Uptake of Methyl Mercury by the Floater Mussel, Pyganodon grandis (Bivalvia, Unionidae), Caged in a Flooded Wetland. Environ. Toxicol. Chem.15(6): 928-936.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	3983	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	3241.6	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	2050.8	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC10	Not Reported	T	1150.2	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Mercury	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1989. Hameed, P.S., and A.I.M. Raj. Effects of Copper, Cadmium and Mercury on Crystalline Style of the Freshwater Mussel Lamellidens marginalis (Lamarck). Indian J. Environ. Health31(2): 131-136.
Mercury	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1991. Raj, A.I.M., and P.S. Hameed. Effect of Copper, Cadmium and Mercury on Metabolism of the Freshwater Mussel Lamellidens marginalis (Lamarck). J. Environ. Biol.12(2): 131-135.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	216	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	233	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	147	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	171	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2754	NA	NR	ug/L	LAB	1991. Sivaramakrishna, B., K. Radhakrishnaiah, and A. Suresh. Assessment of Mercury Toxicity by the Changes in Oxygen Consumption and Ion Levels in the Freshwater Snail, Pila globosa, and the Mussel, Lamellidens. Bull. Environ. Contam. Toxicol.46: 913-920.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3020	NA	NR	ug/L	LAB	1991. Sivaramakrishna, B., K. Radhakrishnaiah, and A. Suresh. Assessment of Mercury Toxicity by the Changes in Oxygen Consumption and Ion Levels in the Freshwater Snail, Pila globosa, and the Mussel, Lamellidens. Bull. Environ. Contam. Toxicol.46: 913-920.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3311	NA	NR	ug/L	LAB	1991. Sivaramakrishna, B., K. Radhakrishnaiah, and A. Suresh. Assessment of Mercury Toxicity by the Changes in Oxygen Consumption and Ion Levels in the Freshwater Snail, Pila globosa, and the Mussel, Lamellidens. Bull. Environ. Contam. Toxicol.46: 913-920.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5283.4	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4417.4	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2958.7	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Mercury chloride (HgCl2)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1892.6	NR	NR	ug/L	LAB	1996. Bhamre, P.R., V.S. Lomte, and K.R. Pawar. Acute Toxicity of Some Selected Heavy Metals to Freshwater Bivalve Parreysia favidens. Pollut. Res.15(2): 143-145.
Mercury	Mussel	Molluscs	Fresh	Reproduction	NR	Not Reported	T	0.0045	NR	NR	ug/L	FIELDN	1996. Malley, D.F., A.R. Stewart, and B.D. Hall. Uptake of Methyl Mercury by the Floater Mussel, Pyganodon grandis (Bivalvia, Unionidae), Caged in a Flooded Wetland. Environ. Toxicol. Chem.15(6): 928-936.
Mercury	Mussel	Molluscs	Fresh	Reproduction	NR	Not Reported	T	0.0033	NR	NR	ug/L	FIELDN	1996. Malley, D.F., A.R. Stewart, and B.D. Hall. Uptake of Methyl Mercury by the Floater Mussel, Pyganodon grandis (Bivalvia, Unionidae), Caged in a Flooded Wetland. Environ. Toxicol. Chem.15(6): 928-936.
Methyl mercury(1+), Ion	Mussel	Molluscs	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDN	1996. Malley, D.F., A.R. Stewart, and B.D. Hall. Uptake of Methyl Mercury by the Floater Mussel, Pyganodon grandis (Bivalvia, Unionidae), Caged in a Flooded Wetland. Environ. Toxicol. Chem.15(6): 928-936.
Methyl mercury(1+), Ion	Mussel	Molluscs	Fresh	Reproduction	NR	Not Reported	T	0.00024	NR	NR	ug/L	FIELDN	1996. Malley, D.F., A.R. Stewart, and B.D. Hall. Uptake of Methyl Mercury by the Floater Mussel, Pyganodon grandis (Bivalvia, Unionidae), Caged in a Flooded Wetland. Environ. Toxicol. Chem.15(6): 928-936.
Mercury	Mussel	Molluscs	NR	Reproduction	NR	Egg	T	20	NA	NR	ug/L	LAB	1986. Shi, J., and J. Yu. A Preliminary Study of Influences of Several Heavy Metal Ions on the Development of Early Embryo of Thick Shell Mussel (Mytilus coruscus Gould). Donghai Mar. Sci. (Donghai Haiyang)4(1): 46-50.
Mercuric nitrate	Mussel, Eastern Elliptio	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Tessier, L., G. Vaillancourt, and L. Pazdernik. Laboratory Study of Cd and Hg Uptake by Two Freshwater Molluscs in Relation to Concentration, Age and Exposure Time. Water Air Soil Pollut.86(1-4): 347-357.
Mercuric nitrate	Mussel, Eastern Elliptio	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Tessier, L., G. Vaillancourt, and L. Pazdernik. Laboratory Study of Cd and Hg Uptake by Two Freshwater Molluscs in Relation to Concentration, Age and Exposure Time. Water Air Soil Pollut.86(1-4): 347-357.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	4654.3	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	668.5	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2480	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	518.9	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2021.9	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	481.7	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1390	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	395	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1054.9	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	227.4	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1012.8	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	87.7	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	335.6	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	63.8	NR	NR	ug/L	LAB	1998. Camargo, J.A., G. Nombela, M. Muniz, and A. Navas. Age Specific Sensitivity of the Nematode Aphelenchus avenae to Mercury Toxicity. Bull. Environ. Contam. Toxicol.61(2): 149-153.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	0.072	L	NR	mmol/L	LAB	1997. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Predicting Relative Metal Toxicity with Ion Characteristics: Caenorhabditis elegans LC50. Aquat. Toxicol.39(3-4): 279-290.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	13000	NR	NR	ug/L	LAB	1994. Stringham, E.G., and E.P.M. Candido. Transgenic hsp16-lacZ Strains of the Soil Nematode Caenorhabditis elegans as Biological Monitors of Environmental Stress. Environ. Toxicol. Chem.13(8): 1211-1220.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Donkin, S.G., and P.L. Williams. Influence of Developmental Stage, Salts and Food Presence on Various End Points Using Caenorhabditis elegans for Aquatic Toxicity Testing. Environ. Toxicol. Chem.14(12): 2139-2147.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	3500	NR	NR	ug/L	LAB	1994. Stringham, E.G., and E.P.M. Candido. Transgenic hsp16-lacZ Strains of the Soil Nematode Caenorhabditis elegans as Biological Monitors of Environmental Stress. Environ. Toxicol. Chem.13(8): 1211-1220.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Mercury chloride (HgCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	440	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Mercury chloride (HgCl2)	Northern House Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1986. Chapman, P.M., and D.G. Mitchell. Acute Tolerance Tests with the Oligochaetes Nais communis (Naididae) and Ilyodrilus frantzi (Tubificidae). Hydrobiologia137(1): 61-64.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	7500	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Mercury chloride (HgCl2)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Mercury	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	1900	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	1000	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury chloride (HgCl2)	Oligochaete Family	Worms	Fresh	Mortality	LC50	Not Reported	T	133*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercury chloride (HgCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
Mercury chloride (HgCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
Mercury chloride (HgCl2)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Mercury chloride (HgCl2)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Mercury chloride (HgCl2)	Ostracod, Seed Shrimp	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	3.04	NA	NR	ug/L	LAB	1995. Handy, R.D.. Comparison of Intermittent and Continuous Exposure to Mercuric Chloride in Rainbow Trout (Oncorhynchus mykiss), Goldfish (Carassius auratus), and the. Can. J. Fish. Aquat. Sci.52(1): 13-22.
Mercury chloride (HgCl2)	Pea Cockle	Molluscs	NR	Mortality	NR	Not Reported	T	3.7	NA	NR	ug/L	LAB	1974. Scheil, H.G., and W. Hinz. Influence of Divalent Mercury Ions on the Filtration Rate of Pisidium Casertanum poli (Bivalvia). Hydrobiologia45(4): 543-545.
Mercury chloride (HgCl2)	Pea Cockle	Molluscs	NR	Mortality	NR	Not Reported	T	740	NA	NR	ug/L	LAB	1974. Scheil, H.G., and W. Hinz. Influence of Divalent Mercury Ions on the Filtration Rate of Pisidium Casertanum poli (Bivalvia). Hydrobiologia45(4): 543-545.
Mercury chloride (HgCl2)	Penaeidean Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Mercury chloride	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	107	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Mercury chloride (HgCl2)	Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1995. Aditya, A.K., and M.P. Bandyopadhyay. Mercuric Chloride Induced Changes in Dugesia bengalensis Kawakatsu, an Aquatic Planarian from Santiniketan, West Bengal. J. Environ. Biol.16(3): 233-236.
Mercury chloride (HgCl2)	Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1995. Aditya, A.K., and M.P. Bandyopadhyay. Mercuric Chloride Induced Changes in Dugesia bengalensis Kawakatsu, an Aquatic Planarian from Santiniketan, West Bengal. J. Environ. Biol.16(3): 233-236.
Mercury chloride (HgCl2)	Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1995. Aditya, A.K., and M.P. Bandyopadhyay. Mercuric Chloride Induced Changes in Dugesia bengalensis Kawakatsu, an Aquatic Planarian from Santiniketan, West Bengal. J. Environ. Biol.16(3): 233-236.
Mercury chloride (HgCl2)	Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1995. Aditya, A.K., and M.P. Bandyopadhyay. Mercuric Chloride Induced Changes in Dugesia bengalensis Kawakatsu, an Aquatic Planarian from Santiniketan, West Bengal. J. Environ. Biol.16(3): 233-236.
Mercury chloride (HgCl2)	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	85	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	555*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	55	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	400*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	25	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	23	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	340*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	376	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	188	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	23	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Mercury chloride (HgCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	135	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.
Mercury chloride (HgCl2)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	68	NA	NR	ug/L	LAB	1986. Patil, H.S., and M.B. Kaliwal. Relative Sensitivity of a Freshwater Prawn Macrobrachium hendersodyanum to Heavy Metals. Environ. Ecol.4(2): 286-288.
Mercury chloride (HgCl2)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	124*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Acute Toxicity of Mercuric Chloride and Cadmium Chloride to Freshwater Prawn, Macrobrachium lamarrei (H. Milne Edwards). Acta Hydrochim. Hydrobiol.12(6): 689-692.
Mercury chloride (HgCl2)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	99*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Acute Toxicity of Mercuric Chloride and Cadmium Chloride to Freshwater Prawn, Macrobrachium lamarrei (H. Milne Edwards). Acta Hydrochim. Hydrobiol.12(6): 689-692.
Mercury chloride (HgCl2)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	83*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Acute Toxicity of Mercuric Chloride and Cadmium Chloride to Freshwater Prawn, Macrobrachium lamarrei (H. Milne Edwards). Acta Hydrochim. Hydrobiol.12(6): 689-692.
Mercury chloride (HgCl2)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Acute Toxicity of Mercuric Chloride and Cadmium Chloride to Freshwater Prawn, Macrobrachium lamarrei (H. Milne Edwards). Acta Hydrochim. Hydrobiol.12(6): 689-692.
Mercury chloride (HgCl2)	Prawn	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Lanzer-DeSouza, M.E., and N.M.M. Dasilva. Influence of Pollutants on Aquatic Crustaceans Decapoda palaemonidae. Iheringia Ser. Misc.2: 13-30.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	125	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	23.8	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	30.4	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	39.3	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	37.7	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Mercury chloride (HgCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	4.3	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Mercury chloride (HgCl2)	Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	17.5	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Mercury chloride (HgCl2)	Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5.37	NR	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Mercury	Quiver Fly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	2000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury chloride (HgCl2)	Rainbow	Molluscs	Fresh	Growth	LOEC	Shell	T	8	NR	NR	ug/L	LAB	2005. Valenti, T.W., D.S. Cherry, R.J. Neves, and J. Schmerfeld. Acute and Chronic Toxicity of Mercury to Early Life Stages of the Rainbow Mussel, Villosa iris (Bivalvia: Unionidae). Environ. Toxicol. Chem.24(5): 1242-1246.
Mercury chloride (HgCl2)	Rainbow	Molluscs	Fresh	Growth	NOEC	Shell	T	4	NR	NR	ug/L	LAB	2005. Valenti, T.W., D.S. Cherry, R.J. Neves, and J. Schmerfeld. Acute and Chronic Toxicity of Mercury to Early Life Stages of the Rainbow Mussel, Villosa iris (Bivalvia: Unionidae). Environ. Toxicol. Chem.24(5): 1242-1246.
Mercury chloride (HgCl2)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	162	NR	NR	ug/L	LAB	2005. Valenti, T.W., D.S. Cherry, R.J. Neves, and J. Schmerfeld. Acute and Chronic Toxicity of Mercury to Early Life Stages of the Rainbow Mussel, Villosa iris (Bivalvia: Unionidae). Environ. Toxicol. Chem.24(5): 1242-1246.
Mercury chloride (HgCl2)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	135	NR	NR	ug/L	LAB	2005. Valenti, T.W., D.S. Cherry, R.J. Neves, and J. Schmerfeld. Acute and Chronic Toxicity of Mercury to Early Life Stages of the Rainbow Mussel, Villosa iris (Bivalvia: Unionidae). Environ. Toxicol. Chem.24(5): 1242-1246.
Mercury chloride (HgCl2)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	39	NR	NR	ug/L	LAB	2005. Valenti, T.W., D.S. Cherry, R.J. Neves, and J. Schmerfeld. Acute and Chronic Toxicity of Mercury to Early Life Stages of the Rainbow Mussel, Villosa iris (Bivalvia: Unionidae). Environ. Toxicol. Chem.24(5): 1242-1246.
Mercury chloride (HgCl2)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	114	NR	NR	ug/L	LAB	2005. Valenti, T.W., D.S. Cherry, R.J. Neves, and J. Schmerfeld. Acute and Chronic Toxicity of Mercury to Early Life Stages of the Rainbow Mussel, Villosa iris (Bivalvia: Unionidae). Environ. Toxicol. Chem.24(5): 1242-1246.
Mercury chloride (HgCl2)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	14	NR	NR	ug/L	LAB	2005. Valenti, T.W., D.S. Cherry, R.J. Neves, and J. Schmerfeld. Acute and Chronic Toxicity of Mercury to Early Life Stages of the Rainbow Mussel, Villosa iris (Bivalvia: Unionidae). Environ. Toxicol. Chem.24(5): 1242-1246.
Mercury chloride (HgCl2)	Rainbow	Molluscs	Fresh	Mortality	LC50	Not Reported	T	99	NR	NR	ug/L	LAB	2005. Valenti, T.W., D.S. Cherry, R.J. Neves, and J. Schmerfeld. Acute and Chronic Toxicity of Mercury to Early Life Stages of the Rainbow Mussel, Villosa iris (Bivalvia: Unionidae). Environ. Toxicol. Chem.24(5): 1242-1246.
Mercury chloride (HgCl2)	Rainbow	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	114	NR	NR	ug/L	LAB	2005. Valenti, T.W., D.S. Cherry, R.J. Neves, and J. Schmerfeld. Acute and Chronic Toxicity of Mercury to Early Life Stages of the Rainbow Mussel, Villosa iris (Bivalvia: Unionidae). Environ. Toxicol. Chem.24(5): 1242-1246.
Mercury chloride (HgCl2)	Rainbow	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	234	NR	NR	ug/L	LAB	2005. Valenti, T.W., D.S. Cherry, R.J. Neves, and J. Schmerfeld. Acute and Chronic Toxicity of Mercury to Early Life Stages of the Rainbow Mussel, Villosa iris (Bivalvia: Unionidae). Environ. Toxicol. Chem.24(5): 1242-1246.
Mercury chloride (HgCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1987. Del Ramo, J., J. Diaz-Mayans, A. Torreblanca, and A. Nunez. Effects of Temperature on the Acute Toxicity of Heavy Metals (Cr, Cd, and Hg) to the Freshwater Crayfish, Procambarus clarkii (Girard). Bull. Environ. Contam. Toxicol.38(5): 736-741.
Mercury chloride (HgCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1987. Del Ramo, J., J. Diaz-Mayans, A. Torreblanca, and A. Nunez. Effects of Temperature on the Acute Toxicity of Heavy Metals (Cr, Cd, and Hg) to the Freshwater Crayfish, Procambarus clarkii (Girard). Bull. Environ. Contam. Toxicol.38(5): 736-741.
Mercury chloride (HgCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	790	NA	NR	ug/L	LAB	1987. Del Ramo, J., J. Diaz-Mayans, A. Torreblanca, and A. Nunez. Effects of Temperature on the Acute Toxicity of Heavy Metals (Cr, Cd, and Hg) to the Freshwater Crayfish, Procambarus clarkii (Girard). Bull. Environ. Contam. Toxicol.38(5): 736-741.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1500	NA	NR	ug/L	LAB	1986. Diaz-Mayans, J., A. Torreblanca, J. Del Ramo, and A. Nunez. Oxygen Uptake by Excised Gills of Procambarus clarkii (Girard) From Albufera Lake of Valencia, Spain, Under Heavy Metal Treatments. Bull. Environ. Contam. Toxicol.36(6): 912-917.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Growth	LOEC	Whole Organism	T	2.7	NR	NR	ug/L	LAB	2008. Sarma, S.S.S., P. Brena-Bustamante, and S. Nandini. Body Size and Population Growth of Brachionus patulus (Rotifera) in Relation to Heavy Metal (Copper and Mercury) Concentrations. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control43(5): 547-553.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Growth	NOEC	Whole Organism	T	1.35	NR	NR	ug/L	LAB	2008. Sarma, S.S.S., P. Brena-Bustamante, and S. Nandini. Body Size and Population Growth of Brachionus patulus (Rotifera) in Relation to Heavy Metal (Copper and Mercury) Concentrations. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control43(5): 547-553.
Mercury	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Mercury	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1991. Snell, T.W., B.D. Moffat, C. Janssen, and G. Persoone. Acute Toxicity Tests Using Rotifers IV. Effects of Cyst Age, Temperature, and Salinity on the Sensitivity of Brachionus calyciflorus. Ecotoxicol. Environ. Saf.21(3): 308-317.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.4	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sarma, S.S.S., T. Ramirez Perez, and S. Nandini. Comparison of the Sensitivitiy of Branchionus calyciflorus and Branchionus patulus (Rotifera) to Selected Heavy Metals Under Low and high Food (Chlorella vulgaris) Levels. Bull. Environ. Contam. Toxicol.64(5): 735-739.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sarma, S.S.S., T. Ramirez Perez, and S. Nandini. Comparison of the Sensitivitiy of Branchionus calyciflorus and Branchionus patulus (Rotifera) to Selected Heavy Metals Under Low and high Food (Chlorella vulgaris) Levels. Bull. Environ. Contam. Toxicol.64(5): 735-739.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	48	NR	NR	ug/L	LAB	1999. Preston, B.L., T.W. Snell, and R. Kneisel. UV-B Exposure Increases Acute Toxicity of Pentachlorophenol and Mercury to the Rotifer Brachionus calyciflorus. Environ. Pollut.106(1): 23-31.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	48	NR	NR	ug/L	LAB	1999. Preston, B.L., T.W. Snell, and R. Kneisel. UV-B Exposure Increases Acute Toxicity of Pentachlorophenol and Mercury to the Rotifer Brachionus calyciflorus. Environ. Pollut.106(1): 23-31.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	51	NR	NR	ug/L	LAB	1999. Preston, B.L., T.W. Snell, and R. Kneisel. UV-B Exposure Increases Acute Toxicity of Pentachlorophenol and Mercury to the Rotifer Brachionus calyciflorus. Environ. Pollut.106(1): 23-31.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	51	NR	NR	ug/L	LAB	1999. Preston, B.L., T.W. Snell, and R. Kneisel. UV-B Exposure Increases Acute Toxicity of Pentachlorophenol and Mercury to the Rotifer Brachionus calyciflorus. Environ. Pollut.106(1): 23-31.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	51	NR	NR	ug/L	LAB	1999. Preston, B.L., T.W. Snell, and R. Kneisel. UV-B Exposure Increases Acute Toxicity of Pentachlorophenol and Mercury to the Rotifer Brachionus calyciflorus. Environ. Pollut.106(1): 23-31.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	59	NR	NR	ug/L	LAB	1999. Preston, B.L., T.W. Snell, and R. Kneisel. UV-B Exposure Increases Acute Toxicity of Pentachlorophenol and Mercury to the Rotifer Brachionus calyciflorus. Environ. Pollut.106(1): 23-31.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	64	NR	NR	ug/L	LAB	1999. Preston, B.L., T.W. Snell, and R. Kneisel. UV-B Exposure Increases Acute Toxicity of Pentachlorophenol and Mercury to the Rotifer Brachionus calyciflorus. Environ. Pollut.106(1): 23-31.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1989. Couillard, Y., P. Ross, and B. Pinel-Alloul. Acute Toxicity of Six Metals to the Rotifer Brachionus calyciflorus, with Comparisons to Other Freshwater Organisms. Toxic. Assess.4(4): 451-462.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sarma, S.S.S., T. Ramirez Perez, and S. Nandini. Comparison of the Sensitivitiy of Branchionus calyciflorus and Branchionus patulus (Rotifera) to Selected Heavy Metals Under Low and high Food (Chlorella vulgaris) Levels. Bull. Environ. Contam. Toxicol.64(5): 735-739.
Mercury chloride (HgCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Sarma, S.S.S., T. Ramirez Perez, and S. Nandini. Comparison of the Sensitivitiy of Branchionus calyciflorus and Branchionus patulus (Rotifera) to Selected Heavy Metals Under Low and high Food (Chlorella vulgaris) Levels. Bull. Environ. Contam. Toxicol.64(5): 735-739.
Mercury	Rotifer	Invertebrates	NR	Mortality	LC50	Not Reported	T	610	NA	NR	ug/L	LAB	1995. Moffat, B.D., and T.W. Snell. Rapid Toxicity Assessment Using an In Vivo Enzyme Test for Brachionus plicatilis (Rotifera). Ecotoxicol. Environ. Saf.30: 47-53.
Mercury	Scud	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.1	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Mercury	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.4	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Mercury chloride (HgCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	670	NA	NR	ug/L	LAB	1997. Pantani, C., G. Pannunzio, M. De Cristofaro, A.A. Novelli, and M. Salvatori. Comparative Acute Toxicity of Some Pesticides, Metals, and Surfactants to Gammarus italicus Goedm. and Echinogammarus tibaldii Pink. and Stock (Crustacea: Amphipoda). Bull. Environ. Contam. Toxicol.59(6): 963-967.
Mercury chloride (HgCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.39*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercury	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2.42	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Mercury	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5.6	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Mercury	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2.42	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Mercury	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5.6	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Mercury	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	100	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Scud	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Mercury	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	90	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	10	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury chloride (HgCl2)	Sea Urchin	Invertebrates	NR	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1976. Castagna, A.. Effect of Mercury on Egg Development in the Sea Urchin Arbacia lixula. Boll. Pesca Piscic. Idrobiol.31(1/2): 163-169.
Mercury chloride (HgCl2)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	27.96	NA	NR	ug/L	LAB	1984. Ghate, H.V.. Gill Melanization and Heavy Metals in Freshwater Prawns. Indian J. Fish.31(3): 389-393.
Mercury chloride (HgCl2)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Mercury chloride (HgCl2)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Mercury chloride (HgCl2)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Mercury chloride (HgCl2)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	0.25	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	0.5	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	0.5	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Growth	NR	Shell	T	1	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Mortality	LC25	Not Reported	T	0.29	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Mortality	LC25	Not Reported	T	0.94	NR	NR	uM	LAB	1997. Allah, A.T.A., M.Q.S. Wanas, and S.N. Thompson. Effects of Heavy Metals on Survival and Growth of Biomphalaria glabrata Say (Gastropoda: Pulmonata) and Interaction with Schistosome Infection. J. Molluscan Stud.63(1): 79-86.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	273*	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	420*	NA	NR	ug/L	LAB	1990. Seth, R.N., R.K. Tyagi, and R.S. Panwar. Toxicity of 2-Methoxy Ethyl Mercuric Chloride, Copper Sulphate and Mercuric Chloride to Freshwater Snail, Viviparus bengalensis (Swainson). J. Environ. Biol.11(3): 263-267.
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	260*	NA	NR	ug/L	LAB	1990. Seth, R.N., R.K. Tyagi, and R.S. Panwar. Toxicity of 2-Methoxy Ethyl Mercuric Chloride, Copper Sulphate and Mercuric Chloride to Freshwater Snail, Viviparus bengalensis (Swainson). J. Environ. Biol.11(3): 263-267.
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	110*	NA	NR	ug/L	LAB	1988. Muley, D.V., and U.H. Mane. Survival and Behaviour of the Freshwater Gastropod Viviparus bengalensis (Lam.) After Exposure to Mercurial Salts in Different Seasons. Trop. Ecol.29(1): 71-78.
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	60*	NA	NR	ug/L	LAB	1988. Muley, D.V., and U.H. Mane. Survival and Behaviour of the Freshwater Gastropod Viviparus bengalensis (Lam.) After Exposure to Mercurial Salts in Different Seasons. Trop. Ecol.29(1): 71-78.
Mercury chloride (HgCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	70*	NA	NR	ug/L	LAB	1988. Muley, D.V., and U.H. Mane. Survival and Behaviour of the Freshwater Gastropod Viviparus bengalensis (Lam.) After Exposure to Mercurial Salts in Different Seasons. Trop. Ecol.29(1): 71-78.
Sulfuric acid, Mercury(2+) salt(1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	60*	NA	NR	ug/L	LAB	1988. Muley, D.V., and U.H. Mane. Survival and Behaviour of the Freshwater Gastropod Viviparus bengalensis (Lam.) After Exposure to Mercurial Salts in Different Seasons. Trop. Ecol.29(1): 71-78.
Sulfuric acid, Mercury(2+) salt(1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	81*	NA	NR	ug/L	LAB	1988. Muley, D.V., and U.H. Mane. Survival and Behaviour of the Freshwater Gastropod Viviparus bengalensis (Lam.) After Exposure to Mercurial Salts in Different Seasons. Trop. Ecol.29(1): 71-78.
Sulfuric acid, Mercury(2+) salt(1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	95*	NA	NR	ug/L	LAB	1988. Muley, D.V., and U.H. Mane. Survival and Behaviour of the Freshwater Gastropod Viviparus bengalensis (Lam.) After Exposure to Mercurial Salts in Different Seasons. Trop. Ecol.29(1): 71-78.
Mercury	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	1100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	6300	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	2100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	80	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Mercury chloride (HgCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Mercury chloride (HgCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	126*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercury chloride (HgCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	58000*	NA	NR	ug/L	LAB	1974. Elder, J.A., and A.R. Gaufin. The Toxicity of Three Mercurials to Pteronarcys californica Newport, and Some Possible Physiological Effects Which Influence the Toxicities. Environ. Res.7(2): 169-175.
Mercury chloride (HgCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	25000*	NA	NR	ug/L	LAB	1974. Elder, J.A., and A.R. Gaufin. The Toxicity of Three Mercurials to Pteronarcys californica Newport, and Some Possible Physiological Effects Which Influence the Toxicities. Environ. Res.7(2): 169-175.
Mercury chloride (HgCl2)	Stonefly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	25000*	NA	NR	ug/L	LAB	1974. Elder, J.A., and A.R. Gaufin. The Toxicity of Three Mercurials to Pteronarcys californica Newport, and Some Possible Physiological Effects Which Influence the Toxicities. Environ. Res.7(2): 169-175.
Mercury chloride (HgCl2)	Swan Mussel	Molluscs	Fresh	Growth	NR	ultiple Tissue/Orga	T	10	NA	NR	ug/L	LAB	1984. Balogh, K., and J. Salanki. The Dynamics of Mercury and Cadmium Uptake into Different Organs of Anodonta cygnea L. Water Res.18(11): 1381-1387.
Mercury chloride (HgCl2)	Tubificid	Worms	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1986. Chapman, P.M., and D.G. Mitchell. Acute Tolerance Tests with the Oligochaetes Nais communis (Naididae) and Ilyodrilus frantzi (Tubificidae). Hydrobiologia137(1): 61-64.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	42		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	51		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	56		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	91		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	39		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	51		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	54		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	91		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	14		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	29.8		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	49		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	51.4		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	14		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	26		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	34		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	48		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	510	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	64	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	83	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	510	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	5600	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	66	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	82	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	380	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1250	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	280	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Mercury	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	300	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	320		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	56		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	32		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	5.6		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Mercury chloride (HgCl2)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Mercury chloride (HgCl2)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Combinations of Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 69-78.
Mercury chloride (HgCl2)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1982. Chapman, P.M., M.A. Farrell, and R.O. Brinkhurst. Relative Tolerances of Selected Aquatic Oligochaetes to Individual Pollutants and Environmental Factors. Aquat. Toxicol.2(1): 47-67.
Mercury chloride (HgCl2)	Turbellarian Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	55.4*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercury chloride (HgCl2)	Turbellarian, Flatworm	Worms	Fresh	Growth	NR		T	NR	NA	NR	uM	LAB	1991. Siegel, B.Z., S.M. Siegel, T. Correa, C. Dagan, G. Galvez, L. LeeLoy, A. Padua, and E. Yaeger. The Protection of Invertebrates, Fish, and Vascular Plants Against Inorganic Mercury Poisoning by Sulfur and Selenium Derivatives. Arch. Environ. Contam. Toxicol.20(2): 241-246.
Mercury	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1974. See, C.L., A.L.,Jr. Buikema, and J.,Jr. Cairns. The Effects of Selected Toxicants on Survival of Dugesia tigrina (Turbellaria). ASB (Assoc. Southeast. Biol.) Bull.21(2): 82.
Mercury chloride (HgCl2)	Water Boatman	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	163*	NA	NR	ug/L	LAB	1983. Slooff, W.. Benthic Macroinvertebrates and Water Quality Assessment: Some Toxicological Considerations. Aquat. Toxicol.4: 73-82.
Mercury chloride (HgCl2)	Water Bug	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Lanzer-DeSouza, M.E., and N.M.M. Dasilva. Influence of Pollutants on Aquatic Crustaceans Decapoda palaemonidae. Iheringia Ser. Misc.2: 13-30.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Growth	EC10	Not Reported	T	7.3	NA	NR	ug/L	LAB	1997. De Coen, W.M., and C.R. Janssen. The Use of Biomarkers in Daphnia magna Toxicity Testing. IV. Cellular Energy Allocation: A new Methodology to Assess the Energy Budget of Toxicant. J. Aquat. Ecosyst. Stress Recovery6: 43-55.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Not Reported	T	15	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Not Reported	T	1.5	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercuric nitrate	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	D	32	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	7	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	1.5	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	15	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	15	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	1.6	NA	NR	ug/L	LAB	1996. Sorvari, J., and M. Sillanpaa. Influence of Metal Complex Formation on Heavy Metal and Free EDTA and DTPA Acute Toxicity Determined by Daphnia magna. Chemosphere33(6): 1119-1127.
Sulfuric acid, Mercury(2+) salt(1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	20	NR	NR	ug/L	LAB	2005. Tsui, M.T.K., W.X. Wang, and L.M. Chu. Influence of Glyphosate and Its Formulation (Roundup) on the Toxicity and Bioavailability of Metals to Ceriodaphnia dubia. Environ. Pollut.138(1): 59-68.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.06	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.1	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.05	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.06	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.3*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.4*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5.5	NA	NR	ug/L	LAB	1974. Baudouin, M.F., and P. Scoppa. Acute Toxicity of Various Metals to Freshwater Zooplankton. Bull. Environ. Contam. Toxicol.12(6): 745-751.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	54	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.4	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	18.6	NA	NR	ug/L	LAB	1994. Fargasova, A.. Toxicity of Metals on Daphnia magna and Tubifex tubifex. Ecotoxicol. Environ. Saf.27(2): 210-213.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.3*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.6*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.1*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.3*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20*	NA	NR	ug/L	LAB	1982. Qureshi, A.A., K.W. Flood, S.R. Thompson, S.M. Janhurst, C.S. Inniss, and D.A. Rokosh. Comparison of a Luminescent Bacterial Test with Other Bioassays for Determining Toxicity of Pure Compounds and Complex Effluents. In: J.G.Pearson, R.B.Foster and W.E.Bishop (Eds.), Aquatic Toxicology and Hazard Assessment, 5th Confrence, ASTM STP 766, Philadelphia, PA: 179-195.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.2*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.2*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.8	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4*	NA	NR	ug/L	LAB	1986. Ziegenfuss, P.S., W.J. Renaudette, and W.J. Adams. Methodology for Assessing the Acute Toxicity of Chemicals Sorbed to Sediments: Testing the Equilibrium Partitioning Theory. In: T.M.Poston and R.Purdy (Eds.), Aquatic Toxicology and Environmental Fate, 9th Volume, ASTM STP 921, Philadelphia, PA: 479-493.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8	NA	NR	ug/L	LAB	1992. Oikari, A., J. Kukkonen, and V. Virtanen. Acute Toxicity of Chemicals to Daphnia magna in Humic Waters. Sci. Total Environ.117-118: 367-377.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5	NR	NR	ug/L	LAB	1979. Kuhn, R., and J.H. Canton. Comparative Hydrobiological-Toxicological Results in Micro- and Macroorganisms of Biological Spectra (Vergleichende Hydrobiologisch-Toxikologische Befunde an Mikro- und Makroorganismen Biologischer Spektren). In: K.Aurand and J.Spaander (Eds.), Reinhaltung des Wassers, Verlag, Berlin, GER: 58-68.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24.563	NA	NR	ug/L	LAB	1990. Jindal, R., and A. Verma. Heavy Metal Toxicity to Daphnia pulex. Indian J. Environ. Health32(3): 289-292.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.2*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.2*	NA	NR	ug/L	LAB	1978. Canton, J.H., and D.M.M. Adema. Reproducibility of Short-Term and Reproduction Toxicity Experiments with Daphnia magna and Comparison of the Sensitivity of Daphnia magna with Daphnia pulex and Daphnia cucullata in Short-Term Experiments. Hydrobiologia59(2): 135-140.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1990. Soundrapandian, S., and K. Venkataraman. Effect of Heavy Metal Salts on the Life History of Daphnia similis Claus (Crustacea: Cladocera). Proc. Indian Acad. Sci. Anim. Sci.99(5): 411-418.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	68	NA	NR	ug/L	LAB	1990. Soundrapandian, S., and K. Venkataraman. Effect of Heavy Metal Salts on the Life History of Daphnia similis Claus (Crustacea: Cladocera). Proc. Indian Acad. Sci. Anim. Sci.99(5): 411-418.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	48*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	30*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	27*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercuric nitrate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.8	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Mercuric nitrate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	8.3	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Mercuric nitrate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Mercuric nitrate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Mercury chloride (Hg2Cl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.7	NR	NR	ug/L	LAB	2000. Guilhermino, L., T. Diamantino, M.C. Silva, and A.M.V.M. Soares. Acute Toxicity Test with Daphnia magna: An Alternative to Mammals in the Prescreening of Chemical Toxicity?. Ecotoxicol. Environ. Saf.46(3): 357-362.
Mercury chloride (Hg2Cl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2	NR	NR	ug/L	LAB	2000. Guilhermino, L., T. Diamantino, M.C. Silva, and A.M.V.M. Soares. Acute Toxicity Test with Daphnia magna: An Alternative to Mammals in the Prescreening of Chemical Toxicity?. Ecotoxicol. Environ. Saf.46(3): 357-362.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	39	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Mercury chloride (Hg2Cl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	93	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Mercury chloride (Hg2Cl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	83	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Mercury chloride (Hg2Cl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	82	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Mercury chloride (Hg2Cl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	78	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (Hg2Cl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	78	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Mercury	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	20000	NR	NR	ug/L	LAB	1960. Bringmann, G., and R. Kuhn. The Water-Toxicological Detection of Insecticides (Zum Wasser-Toxikologischen Nachweis von Insektiziden). Gesund. -Ing.8: 243-244.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LETC	Not Reported	T	12.2	NA	NR	ug/L	LAB	1990. Brkovic-Popovic, I.. Effect of Mercury on the Survival of Daphnia magna. Water Sci. Technol.22(5): 241-246.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LETC	Not Reported	T	37.2	NA	NR	ug/L	LAB	1990. Brkovic-Popovic, I.. Effect of Mercury on the Survival of Daphnia magna. Water Sci. Technol.22(5): 241-246.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LETC	Not Reported	T	9.4	NA	NR	ug/L	LAB	1990. Brkovic-Popovic, I.. Effect of Mercury on the Survival of Daphnia magna. Water Sci. Technol.22(5): 241-246.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LETC	Not Reported	T	9.2	NA	NR	ug/L	LAB	1990. Brkovic-Popovic, I.. Effect of Mercury on the Survival of Daphnia magna. Water Sci. Technol.22(5): 241-246.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	250	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	250	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	250	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	6	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	6	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	6	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercuric nitrate	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	7	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	4	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	4	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	4	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1.28	NA	NR	ug/L	LAB	1982. Biesinger, K.E., L.E. Anderson, and J.G. Eaton. Chronic Effects of Inorganic and Organic Mercury on Daphnia magna: Toxicity, Accumulation, and Loss. Arch. Environ. Contam. Toxicol.11: 769-774.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1.82	NA	NR	ug/L	LAB	1982. Biesinger, K.E., L.E. Anderson, and J.G. Eaton. Chronic Effects of Inorganic and Organic Mercury on Daphnia magna: Toxicity, Accumulation, and Loss. Arch. Environ. Contam. Toxicol.11: 769-774.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	3.53	NA	NR	ug/L	LAB	1982. Biesinger, K.E., L.E. Anderson, and J.G. Eaton. Chronic Effects of Inorganic and Organic Mercury on Daphnia magna: Toxicity, Accumulation, and Loss. Arch. Environ. Contam. Toxicol.11: 769-774.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	2.7	NA	NR	ug/L	LAB	1982. Biesinger, K.E., L.E. Anderson, and J.G. Eaton. Chronic Effects of Inorganic and Organic Mercury on Daphnia magna: Toxicity, Accumulation, and Loss. Arch. Environ. Contam. Toxicol.11: 769-774.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	30		NC	ug/L	LAB	2007. Martins, J.C., M.L. Saker, L.F. Oliva Teles, and V.M. Vasconcelos. Oxygen Consumption by Daphnia magna Straus as a Marker of Chemical Stress in the Aquatic Environment. Environ. Toxicol. Chem.26(9): 1987-1991.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	6.7	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	4	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	4	NR	NR	ug/L	LAB	1985. Adams, W.J., and B.B. Heidolph. Short-Cut Chronic Toxicity Estimates Using Daphnia magna. In: R.D.Cardwell, R.Purdy, and R.C.Bahner (Eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium, ASTM STP 854, Philadelphia, PA: 87-103.
Mercuric nitrate	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	12	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	15	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	15	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	0.72	NA	NR	ug/L	LAB	1982. Biesinger, K.E., L.E. Anderson, and J.G. Eaton. Chronic Effects of Inorganic and Organic Mercury on Daphnia magna: Toxicity, Accumulation, and Loss. Arch. Environ. Contam. Toxicol.11: 769-774.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1997. De Coen, W.M., and C.R. Janssen. The Use of Biomarkers in Daphnia magna Toxicity Testing. IV. Cellular Energy Allocation: A new Methodology to Assess the Energy Budget of Toxicant. J. Aquat. Ecosyst. Stress Recovery6: 43-55.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	18	NA	NR	ug/L	LAB	1997. De Coen, W.M., and C.R. Janssen. The Use of Biomarkers in Daphnia magna Toxicity Testing. IV. Cellular Energy Allocation: A new Methodology to Assess the Energy Budget of Toxicant. J. Aquat. Ecosyst. Stress Recovery6: 43-55.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	nM	LAB	2005. Tsui, M.T.K., and W.X. Wang. Influences of Maternal Exposure on the Tolerance and Physiological Performance of Daphnia magna Under Mercury Stress. Environ. Toxicol. Chem.24(5): 1228-1234.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	1.28	NA	NR	ug/L	LAB	1982. Biesinger, K.E., L.E. Anderson, and J.G. Eaton. Chronic Effects of Inorganic and Organic Mercury on Daphnia magna: Toxicity, Accumulation, and Loss. Arch. Environ. Contam. Toxicol.11: 769-774.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	0.91	NA	NR	ug/L	LAB	1982. Biesinger, K.E., L.E. Anderson, and J.G. Eaton. Chronic Effects of Inorganic and Organic Mercury on Daphnia magna: Toxicity, Accumulation, and Loss. Arch. Environ. Contam. Toxicol.11: 769-774.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	1.82	NA	NR	ug/L	LAB	1982. Biesinger, K.E., L.E. Anderson, and J.G. Eaton. Chronic Effects of Inorganic and Organic Mercury on Daphnia magna: Toxicity, Accumulation, and Loss. Arch. Environ. Contam. Toxicol.11: 769-774.
Mercury chloride (HgCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	3.53	NA	NR	ug/L	LAB	1986. Biesinger, K.E., G.M. Christensen, and J.T. Fiandt. Effects of Metal Salt Mixtures on Daphnia magna Reproduction. Ecotoxicol. Environ. Saf.11(1): 9-14.
Mercury chloride (HgCl2)	Water Scorpion Genus	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	790	NR	NR	ug/L	LAB	1999. Parthasarathi, K., and L.S. Ranganathan. Effect of Mercuric Chloride on Gut Enzyme Activities of Laccotrephes ruber (Linn.). Environ. Ecol.17(3): 563-567.
Mercury chloride	Wavy-Rayed Lampmussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	88	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Mercury	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3100	NR	NR	ug/L	LAB	1998. Rayms-Keller, A., K.E. Olson, M. McGaw, C. Oray, J.O. Carlson, and B.J. Beaty. Effect of Heavy Metals on Aedes aegypti (Diptera: Culicidae) Larvae. Ecotoxicol. Environ. Saf.39(1): 41-47.

Table B-16. Summary of Results from the EcoTox Database for Invertebrates - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1988. Abbasi, S.A., P.C. Nipaney, and R. Soni. Studies on Environmental Management of Mercury (II), Chromium (VI) and Zinc (II) with Respect to the Impact on Some Arthropods and Protozoans - Toxicity of Zinc (II). Int. J. Environ. Stud.32: 181-187.
Mercury chloride (HgCl2)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5600	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Mercury chloride (HgCl2)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5600	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Mercury chloride (HgCl2)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7600	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Mercury	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Rayms-Keller, A., K.E. Olson, M. McGaw, C. Oray, J.O. Carlson, and B.J. Beaty. Effect of Heavy Metals on Aedes aegypti (Diptera: Culicidae) Larvae. Ecotoxicol. Environ. Saf.39(1): 41-47.
Mercury chloride (HgCl2)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.
Mercury chloride (HgCl2)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.
Mercury chloride (HgCl2)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.
Mercury chloride (HgCl2)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.
Mercury chloride (HgCl2)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.
Mercury chloride (HgCl2)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.

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Table B-17. Summary of Results from the EcoTox Database for Invertebrates - Molybdenum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Molybdenum	Amphipod	Crustaceans	Fresh	Mortality	LC50		A	NR			ug/L	LAB	. . . .
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	203200	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210300	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	930	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36800	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	2190	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	360	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	8000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1150	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	4500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	3100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	880	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	2200	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	670	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel	Amphipod	Crustaceans	Fresh	Mortality	LC50		AM	133			ug/L	LAB	. . . .
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	1000000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	50000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	1000000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC0*	Not Reported	T	50000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	5000000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2000000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC100*	Not Reported	T	5000000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC100*	Not Reported	T	2000000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Nickel chloride (NiCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	34000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Nickel chloride (NiCl2)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	1000000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	50000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	5000000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	2000000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	3160000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Nickel(2+)salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	446600		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Nickel(2+)salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	105000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Nickel(2+)salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	634000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Nickel(2+)salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	216000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Nickel(2+)salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	28600		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Nickel(2+)salt (1:1)	Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	61	NA	NR	ug/L	LAB	1986. Abraham, T.J., K.Y.M. Salih, and J. Chacko. Effects of Heavy Metals on the Filtration Rate of Bivalve Villorita cyprinoides (Hanley) var. cochinensis. Indian J. Mar. Sci.15(3): 195-196.
Nickel	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	48400	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	30200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel chloride (NiCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1190	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Nickel chloride (NiCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.0012	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Nickel chloride (NiCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.00036	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.
Nickel chloride (NiCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.00049	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.
Nickel chloride (NiCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.0013	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.
Nickel chloride (NiCl2)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	2700	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Nickel chloride (NiCl2)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	950	NR	NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Nickel chloride (NiCl2)	Ciliated Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.00017	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.
Nickel chloride (NiCl2)	Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1191		NC	ug/L	LAB	2004. Wong, C.K., and A.P. Pak. Acute and Subchronic Toxicity of the Heavy Metals Copper, Chromium, Nickel, and Zinc, Individually and in Mixture, to the Freshwater Copepod Mesocyclops pehpeiensis. Bull. Environ. Contam. Toxicol.73(1): 190-196.
Nickel chloride (NiCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	300	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Nickel chloride (NiCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	880	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Nickel chloride (NiCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	3300	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Nickel chloride (NiCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	1400	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Nickel chloride (NiCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	450	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Nickel chloride (NiCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	6100	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	200000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	5000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC0*	Not Reported	T	200000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC0*	Not Reported	T	5000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	1000000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	80000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC100*	Not Reported	T	1000000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC100*	Not Reported	T	80000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	200000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	5000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	1000000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	80000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Nickel	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	26400	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	21200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel chloride (NiCl2)	Freshwater Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.00105	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.
Nickel chloride (NiCl2)	Hydra	Invertebrates	Fresh	Growth	NR		T	34*	NA	NR	ug/L	LAB	1983. Santiago-Fandino, V.J.R.. The Effects of Nickel and Cadmium on the Growth Rate of Hydra littoralis and an Assessment of the Rate of Uptake of 63Ni and 14C by the Same Organism. Water Res.17(8): 917-923.
Nickel	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel chloride (NiCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Sulfuric acid, Nickel(2+)salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC0	Not Reported	T	100000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC0	Not Reported	T	2500	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC0*	Not Reported	T	100000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC0*	Not Reported	T	2500	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC100	Not Reported	T	50000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC100*	Not Reported	T	50000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Sulfuric acid, Nickel(2+)salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD0	Not Reported	T	100000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD0	Not Reported	T	2500	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD100	Not Reported	T	50000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Nickelous nitrate	Midge	Insects/Spiders	Fresh	Growth	MATC	Not Reported	T	1100	NA	NR	ug/L	LAB	1986. Powlesland, C., and J. George. Acute and Chronic Toxicity of Nickel to Larvae of Chironomus riparis (Meigen). Environ. Pollut. A.42(1): 47-64.
Nickelous nitrate	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	23500	NA	NR	ug/L	LAB	1986. Powlesland, C., and J. George. Acute and Chronic Toxicity of Nickel to Larvae of Chironomus riparis (Meigen). Environ. Pollut. A.42(1): 47-64.
Nickel	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1200	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1080	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1430	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1430	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1710	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1710	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1710	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2730	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2730	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2900	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4100	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4100	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4100	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickel chloride (NiCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Nickelous nitrate	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	150000	NA	NR	ug/L	LAB	1986. Powlesland, C., and J. George. Acute and Chronic Toxicity of Nickel to Larvae of Chironomus riparis (Meigen). Environ. Pollut. A.42(1): 47-64.
Nickelous nitrate	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	174000	NA	NR	ug/L	LAB	1986. Powlesland, C., and J. George. Acute and Chronic Toxicity of Nickel to Larvae of Chironomus riparis (Meigen). Environ. Pollut. A.42(1): 47-64.
Nickelous nitrate	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	184000	NA	NR	ug/L	LAB	1986. Powlesland, C., and J. George. Acute and Chronic Toxicity of Nickel to Larvae of Chironomus riparis (Meigen). Environ. Pollut. A.42(1): 47-64.
Nickelous nitrate	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	72400	NA	NR	ug/L	LAB	1986. Powlesland, C., and J. George. Acute and Chronic Toxicity of Nickel to Larvae of Chironomus riparis (Meigen). Environ. Pollut. A.42(1): 47-64.
Nickelous nitrate	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	81300	NA	NR	ug/L	LAB	1986. Powlesland, C., and J. George. Acute and Chronic Toxicity of Nickel to Larvae of Chironomus riparis (Meigen). Environ. Pollut. A.42(1): 47-64.
Nickelous nitrate	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	84900	NA	NR	ug/L	LAB	1986. Powlesland, C., and J. George. Acute and Chronic Toxicity of Nickel to Larvae of Chironomus riparis (Meigen). Environ. Pollut. A.42(1): 47-64.
Nickel	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	10200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	8600	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid, Nickel(2+)salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	250	NR	NR	ug/L	LAB	1997. Fargasova, A.. Sensitivity of Chironomus plumosus Larvae to V5+, Mo6+, Mn2+, Ni2+, Cu2+, and Cu+ Metal Ions and Their Combinations. Bull. Environ. Contam. Toxicol.59(1): 956-962.
Nickelous nitrate	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	25300	NA	NR	ug/L	LAB	1986. Powlesland, C., and J. George. Acute and Chronic Toxicity of Nickel to Larvae of Chironomus riparis (Meigen). Environ. Pollut. A.42(1): 47-64.
Nickel	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	850000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickelous nitrate	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	13900	NA	NR	ug/L	LAB	1986. Powlesland, C., and J. George. Acute and Chronic Toxicity of Nickel to Larvae of Chironomus riparis (Meigen). Environ. Pollut. A.42(1): 47-64.
Sulfuric acid, Nickel(2+)salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Sulfuric acid, Nickel(2+)salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	471	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Sulfuric acid, Nickel(2+)salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Sulfuric acid, Nickel(2+)salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	252	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Nickel chloride (NiCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	63.4	L	53.4	mmol/L	LAB	1997. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Predicting Relative Metal Toxicity with Ion Characteristics: Caenorhabditis elegans LC50. Aquat. Toxicol.39(3-4): 279-290.
Nickel chloride (NiCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2916000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Nickel chloride (NiCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	185000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Nickel chloride (NiCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Nickel chloride (NiCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	3100	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2500	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2300	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2200	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2100	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2000	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	17000	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	13100	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	11400	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	10600	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	10000	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	9700	NR	NR	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Nickelous nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	68.8	L	58.5	mM	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	NOEC	Not Reported	T	100000	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Sulfuric acid, Nickel(2+)salt (1:1)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Jaworska, M., J. Sepiol, and P. Tomasik. Effect of Metal Ions Under Laboratory Conditions on the Entomopathogenic Steinernema carpocapsae (Rhabditida: Steinernematidae). Water Air Soil Pollut.88(3-4): 331-341.
Nickel	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	16200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	14100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	12160	NA	NR	ug/L	LAB	1995. Phipps, G.L., V.R. Mattson, and G.T. Ankley. Relative Sensitivity of Three Freshwater Benthic Macroinvertebrates to Ten Contaminants. Arch. Environ. Contam. Toxicol.28(3): 281-286.
Nickel chloride (NiCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	100000	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nickel chloride (NiCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	26000	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nickel chloride (NiCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	75000	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nickel chloride (NiCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	15000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Nickel chloride (NiCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	22000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Nickel	Opossum Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	615.1	NR	NR	ug/L	LAB	1991. Toxscan Inc.. Results of Provision E5F Spiked Metals Toxicity Testing 2 to 9 April 1991. Prepared for Kinnetic Lab.Inc.for "Site-Specific Water Quality Objectives for South San Francisco Bay" Report by Larry Walker Assoc.and Kinnetic Lab.Under Subcontract to CH2M Hill: 42 p..

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel	Opossum Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	783.6	NR	NR	ug/L	LAB	1991. Toxscan Inc.. Results of Provision E5F Spiked Metals Toxicity Testing 2 to 9 April 1991. Prepared for Kinnetic Lab.Inc.for "Site-Specific Water Quality Objectives for South San Francisco Bay" Report by Larry Walker Assoc.and Kinnetic Lab.Under Subcontract to CH2M Hill: 42 p..
Nickel	Opossum Shrimp	Crustaceans	NR	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	LAB	1991. Toxscan Inc.. Results of Provision E5F Spiked Metals Toxicity Testing 2 to 9 April 1991. Prepared for Kinnetic Lab.Inc.for "Site-Specific Water Quality Objectives for South San Francisco Bay" Report by Larry Walker Assoc.and Kinnetic Lab.Under Subcontract to CH2M Hill: 42 p..
Nickel chloride (NiCl2)	Oyster Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	246	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Nickel chloride (NiCl2)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	356	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Nickel chloride (NiCl2)	Paper Pondshell	Molluscs	Fresh	Mortality	LC50	Not Reported	T	599	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Nickel chloride (NiCl2)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	524	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Nickel chloride (NiCl2)	Pine Wilt Nematode	Worms	Fresh	Mortality	LD50	Not Reported	T	0.000018	NR	NR	M	LAB	1984. Kobamoto, N., and Y. Izumi. The Nematicidal Effect of Metal Ions on the Pine Wood Nematode, Bursaphelenchus xylophilus. J. Pestic. Sci.9(3): 527-529.
Nickel chloride (NiCl2)	Pine Wilt Nematode	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	0.001	NR	NR	M	LAB	1984. Kobamoto, N., and Y. Izumi. The Nematicidal Effect of Metal Ions on the Pine Wood Nematode, Bursaphelenchus xylophilus. J. Pestic. Sci.9(3): 527-529.
Nickelous nitrate	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	45000	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Nickel chloride (NiCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	6090	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Nickel chloride (NiCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Nickel chloride (NiCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Nickel chloride (NiCl2)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1430	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid, Nickel(2+)salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	23040	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid, Nickel(2+)salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4330	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid, Nickel(2+)salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3820	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid, Nickel(2+)salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2780	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Nickel chloride (NiCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Nickel chloride (NiCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.00128	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.
Nickel chloride (NiCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.0077	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.
Nickel chloride (NiCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.0014	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.
Nickel chloride (NiCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	610	NR	NR	ug/L	LAB	2006. Madoni, P., and M.G. Romeo. Acute Toxicity of Heavy Metals Towards Freshwater Ciliated Protists. Environ. Pollut.141(1): 1-7.
Nickel chloride (NiCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.0011	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.
Nickel chloride (NiCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.00167	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.
Nickel chloride (NiCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	0.00102	NR	NR	ug/L	LAB	2000. Madoni, P.. The Acute Toxicity of Nickel to Freshwater Ciliates. Environ. Pollut.109(1): 53-59.
Sulfuric acid, Nickel(2+)salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	756	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	747	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Nickel	Quiver Fly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	2000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Nickel	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1991. Snell, T.W., B.D. Moffat, C. Janssen, and G. Persoone. Acute Toxicity Tests Using Rotifers IV. Effects of Cyst Age, Temperature, and Salinity on the Sensitivity of Brachionus calyciflorus. Ecotoxicol. Environ. Saf.21(3): 308-317.
Nickel	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	780	NA	NR	ug/L	LAB	1995. Phipps, G.L., V.R. Mattson, and G.T. Ankley. Relative Sensitivity of Three Freshwater Benthic Macroinvertebrates to Ten Contaminants. Arch. Environ. Contam. Toxicol.28(3): 281-286.
Nickel	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	133	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Nickel	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	75	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Nickel chloride (NiCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Nickel chloride (NiCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1900	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nickel chloride (NiCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nickel chloride (NiCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	890	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nickel	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	15000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	15200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	13000	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel chloride (NiCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	204	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.
Nickel chloride (NiCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	237	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.
Nickel chloride (NiCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	239	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.
Nickel chloride (NiCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	38462*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Nickel chloride (NiCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	34454*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Nickel chloride (NiCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	24815*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Nickel chloride (NiCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	14715*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Nickel chloride (NiCl2)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	9915*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Nickel chloride (NiCl2)	Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	124	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickelous nitrate	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Nickel chloride (NiCl2)	Snail, Marsh Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1500*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Nickel chloride (NiCl2)	Snail, Marsh Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1500*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Nickel chloride (NiCl2)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	132	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Nickel chloride (NiCl2)	Southern Rainbow Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	298	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Nickel	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	26000	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	11400	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	14300	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Nickel	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	21200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid, Nickel(2+)salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	33500	NA	NR	ug/L	LAB	1969. Warnick, S.L., and H.L. Bell. The Acute Toxicity of Some Heavy Metals to Different Species of Aquatic Insects. J. Water Pollut. Control Fed.41(2 Pt.1): 280-284.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	44880		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	51410		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	51980		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	58220		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	29590		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	32680		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	36230		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	36870		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	21300		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	26840		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	27790		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	29290		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	18000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	18970		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	25100		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	25460		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Nickel(2+)salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Nickel(2+)salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	120000	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Nickel(2+)salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	21600	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Nickel(2+)salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	33400	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Nickel(2+)salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	669	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	61400	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Nickel(2+)salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Nickel(2+)salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	82	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Nickel(2+)salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	8700	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Nickel(2+)salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	629	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Sulfuric acid, Nickel(2+)salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	537	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Nickel	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	30000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	56000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	56000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel chloride (NiCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	10000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Nickel	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	16800	NA	NR	ug/L	LAB	1974. See, C.L., A.L.,Jr. Buikema, and J.,Jr. Cairns. The Effects of Selected Toxicants on Survival of Dugesia tigrina (Turbellaria). ASB (Assoc. Southeast. Biol.) Bull.21(2): 82.
Nickel chloride (NiCl2)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	15000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Nickel chloride (NiCl2)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	15000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Nickel(2+)salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	7700	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	3300	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	2550	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	D	320	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Nickel	Water Flea	Crustaceans	Fresh	Growth	NR		T	100	NA	NR	ug/L	LAB	1991. Munzinger, A., and F. Monicelli. A Comparison of the Sensitivity of Three Daphnia magna Populations Under Chronic Heavy Metal Stress. Ecotoxicol. Environ. Saf.22: 24-31.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Munzinger, A.. The Influence of Nickel on Population Dynamics and on Some Demographic Parameters of Daphnia magna. Hydrobiologia277(2): 107-120.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	80	NA	NR	ug/L	LAB	1994. Munzinger, A.. The Influence of Nickel on Population Dynamics and on Some Demographic Parameters of Daphnia magna. Hydrobiologia277(2): 107-120.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	120	NA	NR	ug/L	LAB	1994. Munzinger, A.. The Influence of Nickel on Population Dynamics and on Some Demographic Parameters of Daphnia magna. Hydrobiologia277(2): 107-120.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Lazareva, L.P.. Changes in Biological Characteristics of Daphnia magna from Chronic Action of Copper and Nickel at Low Concentrations. Hydrobiol. J.21(5): 59-62.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Hall, T.. Nickel Uptake, Retention and Loss in Daphnia magna. M.S.Thesis, University of Toronto, Toronto, Ontario, Canada: 205 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	10000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	5000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	1000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	250	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	50	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	5000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0*	Not Reported	T	10000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0*	Not Reported	T	5000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0*	Not Reported	T	250	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0*	Not Reported	T	50	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	117	NR	NR	ug/L	LAB	2005. Tsui, M.T.K., W.X. Wang, and L.M. Chu. Influence of Glyphosate and Its Formulation (Roundup) on the Toxicity and Bioavailability of Metals to Ceriodaphnia dubia. Environ. Pollut.138(1): 59-68.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	125	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2500	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	5000	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	5000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100*	Not Reported	T	2500	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100*	Not Reported	T	5000	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.18	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9.31	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	674	NR	NR	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.5	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	19640	NR	NR	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1900	NA	NR	ug/L	LAB	1974. Baudouin, M.F., and P. Scoppa. Acute Toxicity of Various Metals to Freshwater Zooplankton. Bull. Environ. Contam. Toxicol.12(6): 745-751.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	740	NR	NR	ug/L	LAB	1999. Sankaramanachi, S.K., and S.R. Qasim. Metal Toxicity Evaluation Using Bioassay and Microtox. Int. J. Environ. Stud.56(2): 187-199.

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1920	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2360	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4970	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1150	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7300	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	360	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1500*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1500*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	912.332	NA	NR	ug/L	LAB	1990. Jindal, R., and A. Verma. Heavy Metal Toxicity to Daphnia pulex. Indian J. Environ. Health32(3): 289-292.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1480	NR	NR	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	3890	NR	NR	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23590	NR	NR	ug/L	LAB	1992. Wong, C.K.. Effects of Chromium, Copper, Nickel, and Zinc on Survival and Feeding of the Cladoceran Moina macrocopa. Bull. Environ. Contam. Toxicol.49: 593-599.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6480	NR	NR	ug/L	LAB	1992. Wong, C.K.. Effects of Chromium, Copper, Nickel, and Zinc on Survival and Feeding of the Cladoceran Moina macrocopa. Bull. Environ. Contam. Toxicol.49: 593-599.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4080	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2580	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	1978. Hall, T.. Nickel Uptake, Retention and Loss in Daphnia magna. M.S.Thesis, University of Toronto, Toronto, Ontario, Canada: 205 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1034	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1140	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1813	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1836	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1901	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2042	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2171	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2182	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2325	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2717	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3014	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3156	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3316	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3414	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3607	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3757	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	697	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Nickelous nitrate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	915	NA	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Nickelous nitrate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2201	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Nickelous nitrate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	461	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	17300	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	6900	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	4500	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	2000	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	1300	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	22800	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	7200	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	4800	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	3300	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	2100	NA	NR	ug/L	LAB	1960. Cabejszek, I., and M. Stasiak. Investigation on the Influence of some Metals on the Biocoenosis of Water with the Use of Daphnia magna as an Indicator (Part I) (Badania nad Wplywem Niektorych Metali na Biocenoze Wodna przy Zastosowaniu Daphnia magna j. Roczyn. Zabl. Hig. Warsaw11: 303-312.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	10000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	5000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	250	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	50	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	2500	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	5000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	320	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Nickel	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Munzinger, A., and F. Monicelli. A Comparison of the Sensitivity of Three Daphnia magna Populations Under Chronic Heavy Metal Stress. Ecotoxicol. Environ. Saf.22: 24-31.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	3.8	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	160	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Munzinger, A.. Effects of Nickel on Daphnia magna During Chronic Exposure and Alterations in the Toxicity to Generations Pre-Exposed to Nickel. Water Res.24(7): 845-852.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Lazareva, L.P.. Changes in Biological Characteristics of Daphnia magna from Chronic Action of Copper and Nickel at Low Concentrations. Hydrobiol. J.21(5): 59-62.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Hall, T.. Nickel Uptake, Retention and Loss in Daphnia magna. M.S.Thesis, University of Toronto, Toronto, Ontario, Canada: 205 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Nickelous nitrate	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	3.8	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	15	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	7.5	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	7.5	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	320	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1978. Hall, T.. Nickel Uptake, Retention and Loss in Daphnia magna. M.S.Thesis, University of Toronto, Toronto, Ontario, Canada: 205 p..
Nickelous nitrate	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	7.5	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	95	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Nickel	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	100	NA	NR	ug/L	LAB	1991. Munzinger, A., and F. Monicelli. A Comparison of the Sensitivity of Three Daphnia magna Populations Under Chronic Heavy Metal Stress. Ecotoxicol. Environ. Saf.22: 24-31.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	40	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Munzinger, A.. The Influence of Nickel on Population Dynamics and on Some Demographic Parameters of Daphnia magna. Hydrobiologia277(2): 107-120.

Table B-18. Summary of Results from the EcoTox Database for Invertebrates - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Munzinger, A.. The Influence of Nickel on Population Dynamics and on Some Demographic Parameters of Daphnia magna. Hydrobiologia277(2): 107-120.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Munzinger, A.. The Influence of Nickel on Population Dynamics and on Some Demographic Parameters of Daphnia magna. Hydrobiologia277(2): 107-120.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	80	NA	NR	ug/L	LAB	1994. Munzinger, A.. The Influence of Nickel on Population Dynamics and on Some Demographic Parameters of Daphnia magna. Hydrobiologia277(2): 107-120.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	120	NA	NR	ug/L	LAB	1987. Khangarot and Ray. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	80	NA	NR	ug/L	LAB	1987. Khangarot and Ray. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nickel chloride (NiCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	80	NA	NR	ug/L	LAB	1993. Pan and Liang. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Sulfuric acid, Nickel(2+)salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Linder et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nickelous nitrate	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	3.8	NA	NR	ug/L	LAB	1991. Linder et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Sulfuric acid, Nickel(2+)salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1580000	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Sulfuric acid, Nickel(2+)salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1110000	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Sulfuric acid, Nickel(2+)salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	468000	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Sulfuric acid, Nickel(2+)salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	327000	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Sulfuric acid, Nickel(2+)salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	2700000	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.
Sulfuric acid, Nickel(2+)salt (1:1)	Yabby Or Crayfish	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1013000	NR	NR	ug/L	LAB	2007. Khan, S., and D. Nugegoda. Sensitivity of Juvenile Freshwater Crayfish Cherax destructor (Decapoda: Parastacidae) to Trace Metals. Ecotoxicol. Environ. Saf.68(3): 463-469.

ARCADIS

Table B-19. Summary of Results from the EcoTox Database for Invertebrates -PAHs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Polycyclicaromatic hydrocarbons	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	FIELDN	1996. Hatch and Burton. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

Table B-20. Summary of Results from the EcoTox Database for Invertebrates - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1260	Ciliate	Invertebrates	NR	Growth	NR	Not Reported	F	1000	NA	NR	ug/L	LAB	1973. Cooley, N.R., J.M.,Jr. Keltner, and J. Forester. The Polychlorinated Biphenyls, Aroclors 1248 and 1260: Effect on and Accumulation by Tetrahymena pyriformus. J.Protozool.20(3): 443-445.
PCB 1260	Ciliate	Invertebrates	NR	Growth	NR	Not Reported	F	100	NA	NR	ug/L	LAB	1973. Cooley, N.R., J.M.,Jr. Keltner, and J. Forester. The Polychlorinated Biphenyls, Aroclors 1248 and 1260: Effect on and Accumulation by Tetrahymena pyriformus. J.Protozool.20(3): 443-445.
2,4',5-Trichloro-1,1'-biphenyl	Ciliate	Invertebrates	Fresh	Mortality	LD50	Not Reported	F	NR	NA	NR	ug/L	LAB	1993. Mojzis, J., G. Mojzisova, and F. Nistiar. The Effect of Dichlorvos and Polychlorinated Biphenyl (Delor 103) on the Protozoon Tetrahymena pyriformis. Biologia (Bratisl.)48(3): 349-354.
2,4',5-Trichloro-1,1'-biphenyl	Ciliate	Invertebrates	Fresh	Mortality	LD50	Not Reported	F	NR	NA	NR	ug/L	LAB	1993. Mojzis, J., G. Mojzisova, and F. Nistiar. The Effect of Dichlorvos and Polychlorinated Biphenyl (Delor 103) on the Protozoon Tetrahymena pyriformis. Biologia (Bratisl.)48(3): 349-354.
PCB 1254	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	80	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	80	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	100	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	100	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1242	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	30	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1242	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	30	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1254	Daggerblade Grass Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	6.1	NA	NR	ug/L	LAB	1976. Roesijadi, G., S.R. Petrocelli, J.W. Anderson, C.S. Giam, and G.E. Neff. Toxicity of Polychlorinated Biphenyls (Aroclor 1254) to Adult, Juvenile, and Larval Stages of the Shrimp Palaemonetes pugio. Bull. Environ. Contam. Toxicol.15(3): 297-304.
PCB 1254	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	A	200	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	200	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1242	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	A	400	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1242	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	400	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1254	Dragonfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	200	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Dragonfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	A	1000	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Dragonfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	800	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1254	Dragonfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1000	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Dragonfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	1000	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1242	Dragonfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	400	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1242	Dragonfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	A	800	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1242	Dragonfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	F	800	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1254	Grass Shrimp, Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	3	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Grass Shrimp, Freshwater Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	3	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..

Table B-20. Summary of Results from the EcoTox Database for Invertebrates - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
2,2'-Dichloro-1,1'-biphenyl	Great Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	F	1200	NA	NR	nmol	LAB	1990. Wilbrink, M., R. Zijl, and N.P.E. Vermeulen. Toxicological Effects of Bromobenzene and 2,2'-Dichlorobiphenyl on the Pond Snail Lymnaea stagnalis: Histological Stress in Digestive Gland Cells. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.96(2): 253-258.
2,2'-Dichloro-1,1'-biphenyl	Great Pond Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	F	50	NA	NR	ug	LAB	1990. Wilbrink, M., M. Treskes, T.A. De Vlieger, and N.P.E. Vermeulen. Comparative Toxicokinetics of 2,2'- and 4,4'-Dichlorobiphenyls in the Pond Snail Lymnaea stagnalis (L.). Arch. Environ. Contam. Toxicol.19(4): 565-571.
2,2'-Dichloro-1,1'-biphenyl	Great Pond Snail	Molluscs	Fresh	Reproduction	NR		F	300	NA	NR	ug	LAB	1987. Wilbrink, M., J. De Vries, N.P.E. Vermeulen, C. Janse, and T.A. De Vlieger. Effects of Dihalogenated Biphenyls on Various Functional Parameters in the Pond Snail Lymnaea stagnalis. Comp. Biochem. Physiol. A Physiol.87(4): 1025-1031.
PCB 1254	Green Hydra	Invertebrates	Fresh	Reproduction	NR		F	20	NA	NR	ug/L	LAB	1983. Benson, B., and G.M. Boush. Effect of Pesticides and PCBs on Budding Rates of Green Hydra. Bull. Environ. Contam. Toxicol.30(3): 344-350.
PCB 1254	Green Hydra	Invertebrates	Fresh	Reproduction	NR		F	20	NA	NR	ug/L	LAB	1983. Benson, B., and G.M. Boush. Effect of Pesticides and PCBs on Budding Rates of Green Hydra. Bull. Environ. Contam. Toxicol.30(3): 344-350.
2,3',4,4',5-Pentachloro-1,1'-biphenyl	Hydra	Invertebrates	Fresh	Growth	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1991. Becker, M.C.. Toxicity of Polychlorinated Diphenyl Ethers in Hydra attenuata and in Rat Whole Embryo Culture. Ph.D.Thesis, Texas A&M University, College Station, TX: 87
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Hydra	Invertebrates	Fresh	Growth	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1991. Becker, M.C.. Toxicity of Polychlorinated Diphenyl Ethers in Hydra attenuata and in Rat Whole Embryo Culture. Ph.D.Thesis, Texas A&M University, College Station, TX: 87
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Hydra	Invertebrates	Fresh	Growth	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1991. Becker, M.C.. Toxicity of Polychlorinated Diphenyl Ethers in Hydra attenuata and in Rat Whole Embryo Culture. Ph.D.Thesis, Texas A&M University, College Station, TX: 87
PCB 1254	Hydra	Invertebrates	Fresh	Growth	NR		F	4000	NA	NR	ug/L	LAB	1984. Adams, J.A., and H.M. Haileselassie. The Effects of Polychlorinated Biphenyls (Aroclors 1016 and 1254) on Mortality, Reproduction, and Regeneration in Hydra oligactis. Arch. Environ. Contam. Toxicol.13(4): 493-499.
PCB 1254	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	F	NR	NA	NR	ug/L	LAB	1984. Adams, J.A., and H.M. Haileselassie. The Effects of Polychlorinated Biphenyls (Aroclors 1016 and 1254) on Mortality, Reproduction, and Regeneration in Hydra oligactis. Arch. Environ. Contam. Toxicol.13(4): 493-499.
PCB 1254	Hydra	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	F	20000	NA	NR	ug/L	LAB	1981. Adams, J.A., and W.G. Lawson. Effect of PCB (Aroclor 1254) on Reproduction, Behavior, and Survival of Hydra viridis. J. Tenn. Acad. Sci.56(4): 119-122.
PCB 1254	Hydra	Invertebrates	Fresh	Mortality	NR-ZERO	Not Reported	F	10000	NA	NR	ug/L	LAB	1981. Adams, J.A., and W.G. Lawson. Effect of PCB (Aroclor 1254) on Reproduction, Behavior, and Survival of Hydra viridis. J. Tenn. Acad. Sci.56(4): 119-122.
PCB 1254	Hydra	Invertebrates	Fresh	Reproduction	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1981. Adams, J.A., and W.G. Lawson. Effect of PCB (Aroclor 1254) on Reproduction, Behavior, and Survival of Hydra viridis. J. Tenn. Acad. Sci.56(4): 119-122.
PCB 1254	Hydra	Invertebrates	Fresh	Reproduction	NR		F	1000	NA	NR	ug/L	LAB	1984. Adams, J.A., and H.M. Haileselassie. The Effects of Polychlorinated Biphenyls (Aroclors 1016 and 1254) on Mortality, Reproduction, and Regeneration in Hydra oligactis. Arch. Environ. Contam. Toxicol.13(4): 493-499.
PCB 1254	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	A	0.45	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1254	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	A	0.65	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1254	Opossum Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	F	1400	NA	NR	ug/L	LAB	1980. Novak, A., B.S. Walters, and D.R.M. Passino. Toxicity of Contaminants to Invertebrate Food Organisms. Prog.Fish.Res.1980, Great Lakes Fish.Lab., U.S.Fish Wildl.Serv., Ann Arbor, MI: 2.
PCB 1254	Opossum Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	F	1400	NA	NR	ug/L	LAB	1980. Novak, A., B.S. Walters, and D.R.M. Passino. Toxicity of Contaminants to Invertebrate Food Organisms. Prog.Fish.Res.1980, Great Lakes Fish.Lab., U.S.Fish Wildl.Serv., Ann Arbor, MI: 2.
PCB 1242	Ostracod, Seed Shrimp	Crustaceans	NR	Mortality	NR	Not Reported	F	200	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Ostracod, Seed Shrimp	Crustaceans	NR	Mortality	NR	Not Reported	F	2000	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Ostracod, Seed Shrimp	Crustaceans	NR	Mortality	NR-LETH	Not Reported	F	20000	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Ostracod/Seed Shrimp Class	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	F	20000	NR	NR	ug/L	LAB	1972. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. Bull. Environ. Contam. Toxicol.8(3): 129-137.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Scud	Crustaceans	Fresh	Growth	NR		A	NR	NA	NR	ug/L	LAB	1990. Borgmann, U., W.P. Norwood, and K.M. Ralph. Chronic Toxicity and Bioaccumulation of 2,5,2',5'- and 3,4,3',4'-Tetrachlorobiphenyl and Aroclor 1242 in the Amphipod Hyalella azteca. Arch. Environ. Contam. Toxicol.19(4): 558-564.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Scud	Crustaceans	Fresh	Growth	NR		A	NR	NA	NR	ug/L	LAB	1990. Borgmann, U., W.P. Norwood, and K.M. Ralph. Chronic Toxicity and Bioaccumulation of 2,5,2',5'- and 3,4,3',4'-Tetrachlorobiphenyl and Aroclor 1242 in the Amphipod Hyalella azteca. Arch. Environ. Contam. Toxicol.19(4): 558-564.

Table B-20. Summary of Results from the EcoTox Database for Invertebrates - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1242	Scud	Crustaceans	Fresh	Growth	NR		A	NR	NA	NR	ug/L	LAB	1990. Borgmann, U., W.P. Norwood, and K.M. Ralph. Chronic Toxicity and Bioaccumulation of 2,5,2',5'- and 3,4,3',4'-Tetrachlorobiphenyl and Aroclor 1242 in the Amphipod Hyalella azteca. Arch. Environ. Contam. Toxicol.19(4): 558-564.
PCB 1254	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	2400	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1254	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	2400	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	210	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	430	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	210	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1242	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	5	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1242	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	5	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1242	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	10	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1242	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	72	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1242	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	74	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1242	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	10	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1990. Borgmann, U., W.P. Norwood, and K.M. Ralph. Chronic Toxicity and Bioaccumulation of 2,5,2',5'- and 3,4,3',4'-Tetrachlorobiphenyl and Aroclor 1242 in the Amphipod Hyalella azteca. Arch. Environ. Contam. Toxicol.19(4): 558-564.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1990. Borgmann, U., W.P. Norwood, and K.M. Ralph. Chronic Toxicity and Bioaccumulation of 2,5,2',5'- and 3,4,3',4'-Tetrachlorobiphenyl and Aroclor 1242 in the Amphipod Hyalella azteca. Arch. Environ. Contam. Toxicol.19(4): 558-564.
PCB 1242	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1990. Borgmann, U., W.P. Norwood, and K.M. Ralph. Chronic Toxicity and Bioaccumulation of 2,5,2',5'- and 3,4,3',4'-Tetrachlorobiphenyl and Aroclor 1242 in the Amphipod Hyalella azteca. Arch. Environ. Contam. Toxicol.19(4): 558-564.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Scud	Crustaceans	Fresh	Reproduction	NR		A	NR	NA	NR	ug/L	LAB	1990. Borgmann, U., W.P. Norwood, and K.M. Ralph. Chronic Toxicity and Bioaccumulation of 2,5,2',5'- and 3,4,3',4'-Tetrachlorobiphenyl and Aroclor 1242 in the Amphipod Hyalella azteca. Arch. Environ. Contam. Toxicol.19(4): 558-564.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Scud	Crustaceans	Fresh	Reproduction	NR		A	NR	NA	NR	ug/L	LAB	1990. Borgmann, U., W.P. Norwood, and K.M. Ralph. Chronic Toxicity and Bioaccumulation of 2,5,2',5'- and 3,4,3',4'-Tetrachlorobiphenyl and Aroclor 1242 in the Amphipod Hyalella azteca. Arch. Environ. Contam. Toxicol.19(4): 558-564.
PCB 1242	Scud	Crustaceans	Fresh	Reproduction	NR		A	2.8	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1242	Scud	Crustaceans	Fresh	Reproduction	NR		A	8.7	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1242	Scud	Crustaceans	Fresh	Reproduction	NR		A	NR	NA	NR	ug/L	LAB	1990. Borgmann, U., W.P. Norwood, and K.M. Ralph. Chronic Toxicity and Bioaccumulation of 2,5,2',5'- and 3,4,3',4'-Tetrachlorobiphenyl and Aroclor 1242 in the Amphipod Hyalella azteca. Arch. Environ. Contam. Toxicol.19(4): 558-564.
2,2'-Dichloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Growth	NR		F	NR	NA	NR	ug/L	LAB	1988. Bridgham, S.D.. Chronic Effects of 2,2'-Dichlorobiphenyl on Reproduction, Mortality, Growth, and Respiration of Daphnia pulicaria. Arch. Environ. Contam. Toxicol.17(6): 731-740.
4-Chloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	420	NA	NR	ug/L	LAB	1982. Dill, D.C., M.A. Mayes, C.G. Mendoza, G.U. Boggs, and J.A. Emmitte. Comparison of the Toxicities of Biphenyl, Monochlorobiphenyl, and 2,2',4,4'-Tetrachlorobiphenyl to Fish and Daphnids. In: J.G.Pearson, R.B.Foster, and W.E.Bishop (Eds.), Aquatic Toxicology and Hazard Assessment, 5th Conference, ASTM STP 766, Philadelphia, PA: 245-256.

Table B-20. Summary of Results from the EcoTox Database for Invertebrates - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1260	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	36	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1254	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	1.8	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1254	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	24	NA	NR	ug/L	LAB	1975. Maki, A.W., and H.E. Johnson. Effects of PCB (Aroclor 1254) and p,p'-DDT on Production and Survival of Daphnia magna Strauss. Bull. Environ. Contam. Toxicol.13(4): 412-416.
PCB 1254	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	1.3	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1254	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	31	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
2,4,5-Trichloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	590	NA	NR	ug/L	LAB	1997. Zou, E., and M. Fingerman. Effects of Estrogenic Xenobiotics on Molting of the Water Flea, Daphnia magna. Ecotoxicol. Environ. Saf.38(3): 281-285.
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	230	NA	NR	ug/L	LAB	1997. Zou, E., and M. Fingerman. Effects of Estrogenic Xenobiotics on Molting of the Water Flea, Daphnia magna. Ecotoxicol. Environ. Saf.38(3): 281-285.
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	67	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
2,4,4'-Trichloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	A	1.5	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
2,2'-Dichloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1988. Bridgham, S.D.. Chronic Effects of 2,2'-Dichlorobiphenyl on Reproduction, Mortality, Growth, and Respiration of Daphnia pulicaria. Arch. Environ. Contam. Toxicol.17(6): 731-740.
2,3,4,5,6-Pentachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	A	2.8	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
2,3',4,4',5-Pentachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	A	0.3	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	A	1.3	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	1000	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
2,2',3,4,4',5,5'-Heptachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
2,2',5-Trichloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	A	86	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	A	1.2	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
2,2',3,3',4,4'-Hexachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	A	0.4	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	A	0.238	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..

Table B-20. Summary of Results from the EcoTox Database for Invertebrates - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	2	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	2	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	20	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	F	20	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	F	2000	NR	NR	ug/L	LAB	1972. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. Bull. Environ. Contam. Toxicol.8(3): 129-137.
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	F	20000	NR	NR	ug/L	LAB	1972. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. Bull. Environ. Contam. Toxicol.8(3): 129-137.
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	F	200	NR	NR	ug/L	LAB	1972. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. Bull. Environ. Contam. Toxicol.8(3): 129-137.
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	F	2000	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	F	2000	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	F	0.52	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	F	200	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	F	200	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1260	Water Flea	Crustaceans	Fresh	Reproduction	EC50		F	33	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1254	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	F	19	NA	NR	ug/L	LAB	1975. Maki, A.W., and H.E. Johnson. Effects of PCB (Aroclor 1254) and p,p'-DDT on Production and Survival of Daphnia magna Strauss. Bull. Environ. Contam. Toxicol.13(4): 412-416.
PCB 1254	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	F	23	NA	NR	ug/L	LAB	1975. Maki, A.W., and H.E. Johnson. Effects of PCB (Aroclor 1254) and p,p'-DDT on Production and Survival of Daphnia magna Strauss. Bull. Environ. Contam. Toxicol.13(4): 412-416.
PCB 1254	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	F	25	NA	NR	ug/L	LAB	1975. Maki, A.W., and H.E. Johnson. Effects of PCB (Aroclor 1254) and p,p'-DDT on Production and Survival of Daphnia magna Strauss. Bull. Environ. Contam. Toxicol.13(4): 412-416.
PCB 1254	Water Flea	Crustaceans	Fresh	Reproduction	EC50		A	1.1	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1254	Water Flea	Crustaceans	Fresh	Reproduction	EC50		A	1.3	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1254	Water Flea	Crustaceans	Fresh	Reproduction	EC50		F	28	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.
PCB 1242	Water Flea	Crustaceans	Fresh	Reproduction	EC50		F	63	NA	NR	ug/L	LAB	1974. Nebeker, A.V., and F.A. Puglisi. Effect of Polychlorinated Biphenyls (PCB's) on Survival and Reproduction of Daphnia, Gammarus, and Tanytarsus. Trans. Am. Fish. Soc.103(4): 722-728.

Table B-20. Summary of Results from the EcoTox Database for Invertebrates - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
2,2'-Dichloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Reproduction	NR		F	NR	NA	NR	ug/L	LAB	1988. Bridgham, S.D.. Chronic Effects of 2,2'-Dichlorobiphenyl on Reproduction, Mortality, Growth, and Respiration of Daphnia pulicaria. Arch. Environ. Contam. Toxicol.17(6): 731-740.
2,3',4,4',5-Pentachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	F	5	NA	NR	ug/L	LAB	1993. Black, M.C., W. Burton, J.F. McCarthy, M.J. Peterson, and G.R. Southworth. Accumulation of Contaminants by Biota in East Fork Poplar Creek. In: Oak Ridge Y12 Plant, Environ.Sci.Div.Publ.No.3859, Oak Ridge Natl.Lab., Oak Ridge, TN4: 109-172.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Reproduction	NR		F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Reproduction	NR		F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	F	1000	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
2,2',3,4,4',5,5'-Heptachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Reproduction	NR		F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Water Flea	Crustaceans	Fresh	Reproduction	NR		F	1	NA	NR	ug/L	LAB	1990. Dillon, T.M., W.H. Benson, R.A. Stackhouse, and A.M. Crider. Effects of Selected PCB Congeners on Survival, Growth, and Reproduction in Daphnia magna. Environ. Toxicol. Chem.9(10): 1317-1326.

Table B-21. Summary of Results from the EcoTox Database for Invertebrates - Selenium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Selenium	Amphipod	Crustaceans	Fresh	Mortality	LC50		AN	118			ug/L	LAB	. . . .
Selenium	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Alaimo, J., R.S. Ogle, and A.W. Knight. Selenium Uptake By Larval Chironomus Decorus From A Ruppia Maritima-Based Benthic/Detrital Substrate. Arch. Environ. Contam. Toxicol.27(4): 441-448.
Selenium	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Alaimo, J., R.S. Ogle, and A.W. Knight. Selenium Uptake By Larval Chironomus Decorus From A Ruppia Maritima-Based Benthic/Detrital Substrate. Arch. Environ. Contam. Toxicol.27(4): 441-448.
Selenium	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	16200	NA	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Selenium	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1991. Snell, T.W., B.D. Moffat, C. Janssen, and G. Persoone. Acute Toxicity Tests Using Rotifers IV. Effects of Cyst Age, Temperature, and Salinity on the Sensitivity of Brachionus calyciflorus. Ecotoxicol. Environ. Saf.21(3): 308-317.
Selenium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1980. Halter, M.T., W.J. Adams, and H.E. Johnson. Selenium Toxicity to Daphnia magna, Hyallela azteca, and the Fathead Minnow in Hard Water. Bull. Environ. Contam. Toxicol.24(1): 102-107.
Selenium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	940	NA	NR	ug/L	LAB	1980. Halter, M.T., W.J. Adams, and H.E. Johnson. Selenium Toxicity to Daphnia magna, Hyallela azteca, and the Fathead Minnow in Hard Water. Bull. Environ. Contam. Toxicol.24(1): 102-107.
Selenium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1980. Halter, M.T., W.J. Adams, and H.E. Johnson. Selenium Toxicity to Daphnia magna, Hyallela azteca, and the Fathead Minnow in Hard Water. Bull. Environ. Contam. Toxicol.24(1): 102-107.
Selenium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	41	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Selenium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	118	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Selenium	Water Flea	Crustaceans	Fresh	Growth	MATC	Not Reported	T	115	NA	NR	ug/L	LAB	1990. Ingersoll, C.G., F.J. Dwyer, and T.W. May. Toxicity of Inorganic and Organic Selenium to Daphnia magna (Cladocera) and Chironomus riparius (Diptera). Environ. Toxicol. Chem.9(9): 1171-1181.
Selenium	Water Flea	Crustaceans	Fresh	Growth	NOEC	Not Reported	T	85	NA	NR	ug/L	LAB	1990. Ingersoll, C.G., F.J. Dwyer, and T.W. May. Toxicity of Inorganic and Organic Selenium to Daphnia magna (Cladocera) and Chironomus riparius (Diptera). Environ. Toxicol. Chem.9(9): 1171-1181.
Selenium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Selenium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	430	NA	NR	ug/L	LAB	1980. Halter, M.T., W.J. Adams, and H.E. Johnson. Selenium Toxicity to Daphnia magna, Hyallela azteca, and the Fathead Minnow in Hard Water. Bull. Environ. Contam. Toxicol.24(1): 102-107.
Selenium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	710	NA	NR	ug/L	LAB	1980. Halter, M.T., W.J. Adams, and H.E. Johnson. Selenium Toxicity to Daphnia magna, Hyallela azteca, and the Fathead Minnow in Hard Water. Bull. Environ. Contam. Toxicol.24(1): 102-107.
Selenium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	430	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Selenium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	430	NA	NR	ug/L	LAB	1980. Halter, M.T., W.J. Adams, and H.E. Johnson. Selenium Toxicity to Daphnia magna, Hyallela azteca, and the Fathead Minnow in Hard Water. Bull. Environ. Contam. Toxicol.24(1): 102-107.
Selenium	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	220	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Selenium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	711	NA	NR	ug/L	LAB	1990. Ingersoll, C.G., F.J. Dwyer, and T.W. May. Toxicity of Inorganic and Organic Selenium to Daphnia magna (Cladocera) and Chironomus riparius (Diptera). Environ. Toxicol. Chem.9(9): 1171-1181.
Selenium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1410	NA	NR	ug/L	LAB	1990. Ingersoll, C.G., F.J. Dwyer, and T.W. May. Toxicity of Inorganic and Organic Selenium to Daphnia magna (Cladocera) and Chironomus riparius (Diptera). Environ. Toxicol. Chem.9(9): 1171-1181.
Selenium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	280	NA	NR	ug/L	LAB	1980. Halter, M.T., W.J. Adams, and H.E. Johnson. Selenium Toxicity to Daphnia magna, Hyallela azteca, and the Fathead Minnow in Hard Water. Bull. Environ. Contam. Toxicol.24(1): 102-107.
Selenium	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	2	NA	NR	ug/L	LAB	1993. Hyne, R.V., A. Padovan, D.L. Parry, and S.M. Renaud. Increased Fecundity of the Cladoceran Moinodaphnia macleayi on a Diet Supplemented with a Green Alga, and Its Use in Uranium Toxicity Tests. Aust. J. Mar. Freshw. Res.44(3): 389-399.
Selenium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	156	NA	NR	ug/L	LAB	1990. Ingersoll, C.G., F.J. Dwyer, and T.W. May. Toxicity of Inorganic and Organic Selenium to Daphnia magna (Cladocera) and Chironomus riparius (Diptera). Environ. Toxicol. Chem.9(9): 1171-1181.

Table B-21. Summary of Results from the EcoTox Database for Invertebrates - Selenium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Selenium	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	348	NA	NR	ug/L	LAB	1990. Ingersoll, C.G., F.J. Dwyer, and T.W. May. Toxicity of Inorganic and Organic Selenium to Daphnia magna (Cladocera) and Chironomus riparius (Diptera). Environ. Toxicol. Chem.9(9): 1171-1181.
Selenium	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	280	NA	NR	ug/L	LAB	1980. Halter, M.T., W.J. Adams, and H.E. Johnson. Selenium Toxicity to Daphnia magna, Hyallela azteca, and the Fathead Minnow in Hard Water. Bull. Environ. Contam. Toxicol.24(1): 102-107.

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Table B-22. Summary of Results from the EcoTox Database for Invertebrates -Silica

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Silicic acid, Sodium salt	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	632000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	630000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	630000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	632000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Scud Order	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	895000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Scud Order	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	263000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Scud Order	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	261000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Scud Order	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	247000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	575000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	494000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	413000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	216000	NA	NR	ug/L	LAB	1965. Dowden, B.F., and H.J. Bennett. Toxicity of Selected Chemicals to Certain Animals. J. Water Pollut. Control Fed.37(9): 1308-1316.
Silicic acid, Sodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	575000	NA	NR	ug/L	LAB	1961. Dowden, B.F.. Cumulative Toxicities of Some Inorganic Salts to Daphnia magna as Determined by Median Tolerance Limits. Proc. La. Acad. Sci.23: 77-85.
Silicic acid, Sodium salt	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	494000	NA	NR	ug/L	LAB	1961. Dowden, B.F.. Cumulative Toxicities of Some Inorganic Salts to Daphnia magna as Determined by Median Tolerance Limits. Proc. La. Acad. Sci.23: 77-85.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Silver	Amphipod	Crustaceans	Fresh	Mortality	LC50		AN	1.05			ug/L	LAB	. . . .
Nitric acid, silver (1+) salt	Asiatic Clam	Molluscs	Fresh	Growth	LOEC	Not Reported	T	7.8	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Asiatic Clam	Molluscs	Fresh	Growth	NOEC	Not Reported	T	2.6	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	154.5	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Asiatic Clam	Molluscs	Fresh	Mortality	LOEC	Not Reported	T	26	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Asiatic Clam	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	7.8	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1987. Holcombe, G.W., G.L. Phipps, A.H. Sulaiman, and A.D. Hoffman. Simultaneous Multiple Species Testing: Acute Toxicity of 13 Chemicals to 12 Diverse Freshwater Amphibian, Fish, and Invertebrate Families. Arch. Environ. Contam. Toxicol.16: 697-710.
Silver	Daphnid Family	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	250		NC	nM	LAB	2001. Hook, S.E., and N.S. Fisher. Sublethal Effects of Silver in Zooplankton: Importance of Exposure Pathways and Implications for Toxicity Testing. Environ. Toxicol. Chem.20(3): 568-574.
Nitric acid, silver (1+) salt	Devil Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	65.85		NC	ug/L	LAB	2002. Bianchini, A., M. Grosell, S.M. Gregory, and C.M. Wood. Acute Silver Toxicity in Aquatic Animals is a Function of Sodium Uptake Rate. Environ. Sci. Technol.36(8): 1763-1766.
Nitric acid, silver (1+) salt	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	29	NA	NR	ug/L	LAB	1987. Holcombe, G.W., G.L. Phipps, A.H. Sulaiman, and A.D. Hoffman. Simultaneous Multiple Species Testing: Acute Toxicity of 13 Chemicals to 12 Diverse Freshwater Amphibian, Fish, and Invertebrate Families. Arch. Environ. Contam. Toxicol.16: 697-710.
Nitric acid, silver (1+) salt	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	59	D	53	ug/L	LAB	1986. Brooke, L.T., D.J. Call, C.A. Lindberg, T.P. Markee, S.H. Poirier, and D.J. McCauley. Acute Toxicity of Silver to Selected Freshwater Invertebrates. Report to: Battelle Memorial Research Institute, Columbus, Ohio, Subcontract No.F-4114(8834)-411; Center for Lake Superior Environmental Studies, University of Wisconsin-Superior, Superior, WI:11 p..
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	25600		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	34000		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	34100		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	34100		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	37100		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	42200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Silver chloride	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Growth	LOEC	Heart	T	NR	D	NR	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, and D. Gruber. Use of the Mayfly Stenonema modestum (Heptageniidae) in Subacute Toxicity Assessments. Environ. Toxicol. Chem.11(3): 415-425.
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6.8	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	8.7	D	5	ug/L	LAB	1986. Brooke, L.T., D.J. Call, C.A. Lindberg, T.P. Markee, S.H. Poirier, and D.J. McCauley. Acute Toxicity of Silver to Selected Freshwater Invertebrates. Report to: Battelle Memorial Research Institute, Columbus, Ohio, Subcontract No.F-4114(8834)-411; Center for Lake Superior Environmental Studies, University of Wisconsin-Superior, Superior, WI:11 p..
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3.9	D	2.2	ug/L	LAB	1986. Brooke, L.T., D.J. Call, C.A. Lindberg, T.P. Markee, S.H. Poirier, and D.J. McCauley. Acute Toxicity of Silver to Selected Freshwater Invertebrates. Report to: Battelle Memorial Research Institute, Columbus, Ohio, Subcontract No.F-4114(8834)-411; Center for Lake Superior Environmental Studies, University of Wisconsin-Superior, Superior, WI:11 p..
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3.9	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	9.3	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	12.9	D	5.8	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, and D. Gruber. Use of the Mayfly Stenonema modestum (Heptageniidae) in Subacute Toxicity Assessments. Environ. Toxicol. Chem.11(3): 415-425.
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	LOEC	Not Reported	T	12.9	D	5.8	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, and D. Gruber. Use of the Mayfly Stenonema modestum (Heptageniidae) in Subacute Toxicity Assessments. Environ. Toxicol. Chem.11(3): 415-425.
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	3.1	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	6.6	D	3.7	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, and D. Gruber. Use of the Mayfly Stenonema modestum (Heptageniidae) in Subacute Toxicity Assessments. Environ. Toxicol. Chem.11(3): 415-425.
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	NOEC	Not Reported	T	6.6	D	3.7	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, and D. Gruber. Use of the Mayfly Stenonema modestum (Heptageniidae) in Subacute Toxicity Assessments. Environ. Toxicol. Chem.11(3): 415-425.
Silver	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	9	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, silver (1+) salt	Mayfly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	50	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Growth	LOEC	Not Reported	D	127	NR	NR	ug/L	LAB	1999. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Silver Toxicity to Chironomus tentans in Two Freshwater Sediments. Environ. Toxicol. Chem.18(1): 30-39.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Growth	LOEC	Not Reported	D	66	NR	NR	ug/L	LAB	1999. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Silver Toxicity to Chironomus tentans in Two Freshwater Sediments. Environ. Toxicol. Chem.18(1): 30-39.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Growth	LOEC	Not Reported	D	127	NR	NR	ug/L	LAB	1999. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Silver Toxicity to Chironomus tentans in Two Freshwater Sediments. Environ. Toxicol. Chem.18(1): 30-39.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Growth	NOEC	Not Reported	D	34	NR	NR	ug/L	LAB	1999. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Silver Toxicity to Chironomus tentans in Two Freshwater Sediments. Environ. Toxicol. Chem.18(1): 30-39.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Growth	NOEC	Not Reported	D	13	NR	NR	ug/L	LAB	1999. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Silver Toxicity to Chironomus tentans in Two Freshwater Sediments. Environ. Toxicol. Chem.18(1): 30-39.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Growth	NOEC	Not Reported	D	34	NR	NR	ug/L	LAB	1999. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Silver Toxicity to Chironomus tentans in Two Freshwater Sediments. Environ. Toxicol. Chem.18(1): 30-39.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Growth	NOEC	Not Reported	T	125	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	1999. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Silver Toxicity to Chironomus tentans in Two Freshwater Sediments. Environ. Toxicol. Chem.18(1): 30-39.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	L	35	NR	NR	ug/L	LAB	1999. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Silver Toxicity to Chironomus tentans in Two Freshwater Sediments. Environ. Toxicol. Chem.18(1): 30-39.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	63	D	57	ug/L	LAB	1999. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Silver Toxicity to Chironomus tentans in Two Freshwater Sediments. Environ. Toxicol. Chem.18(1): 30-39.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	D	15100	NR	NR	ug/L	LAB	1999. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Silver Toxicity to Chironomus tentans in Two Freshwater Sediments. Environ. Toxicol. Chem.18(1): 30-39.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	259	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	858*	NA	NR	ug/L	LAB	1986. Ziegenfuss, P.S., W.J. Renaudette, and W.J. Adams. Methodology for Assessing the Acute Toxicity of Chemicals Sorbed to Sediments: Testing the Equilibrium Partitioning Theory. In: T.M.Poston and R.Purdy (Eds.), Aquatic Toxicology and Environmental Fate, 9th Volume, ASTM STP 921, Philadelphia, PA: 479-493.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	676	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	420	NA	NR	ug/L	LAB	1987. Holcombe, G.W., G.L. Phipps, A.H. Sulaiman, and A.D. Hoffman. Simultaneous Multiple Species Testing: Acute Toxicity of 13 Chemicals to 12 Diverse Freshwater Amphibian, Fish, and Invertebrate Families. Arch. Environ. Contam. Toxicol.16: 697-710.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3100		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3900		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4800		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7800		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7800		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7800		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9800		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9800		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	12280	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	12290	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	13390	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	13390	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	13390	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	15210	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	15210	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3100	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3900	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4800	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7800	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7800	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7800	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9240	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9800	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9800	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	12400	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5600	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Silver chloride	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Nitric acid, silver (1+) salt	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	1999. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Silver Toxicity to Chironomus tentans in Two Freshwater Sediments. Environ. Toxicol. Chem.18(1): 30-39.
Nitric acid, silver (1+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Nitric acid, silver (1+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Nitric acid, silver (1+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Nitric acid, silver (1+) salt	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Nitric acid, silver (1+) salt	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	16.3	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Nitric acid, silver (1+) salt	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	52	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Nitric acid, silver (1+) salt	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	133	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Nitric acid, silver (1+) salt	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	150	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Nitric acid, silver (1+) salt	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	19.4	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Nitric acid, silver (1+) salt	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	9.2	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Nitric acid, silver (1+) salt	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	6.4	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Nitric acid, silver (1+) salt	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4.2	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Silver sulfate	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1986. Patil, H.S., and M.B. Kaliwal. Relative Sensitivity of a Freshwater Prawn Macrobrachium hendersodyanum to Heavy Metals. Environ. Ecol.4(2): 286-288.
Nitric acid, silver (1+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Nitric acid, silver (1+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Nitric acid, silver (1+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Nitric acid, silver (1+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Nitric acid, silver (1+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	15.3	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	8.79	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Nitric acid, silver (1+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	9	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Nitric acid, silver (1+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	8.8	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Nitric acid, silver (1+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Nitric acid, silver (1+) salt	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Nalecz-Jawecki, G., K. Demkowicz-Dobrzanski, and J. Sawicki. Protozoan Spirostomum ambiguum as a Highly Sensitive Bioindicator for Rapid and Easy Determination of Water Quality. Sci. Total Environ.Suppl(Pt.2): 1227-1234.
Silver	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Silver	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Silver	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Silver	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Silver	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Silver	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Silver	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Silver	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	7.5	NA	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Silver	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	7.5	NA	NR	ug/L	LAB	1991. Snell, T.W., B.D. Moffat, C. Janssen, and G. Persoone. Acute Toxicity Tests Using Rotifers IV. Effects of Cyst Age, Temperature, and Salinity on the Sensitivity of Brachionus calyciflorus. Ecotoxicol. Environ. Saf.21(3): 308-317.
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Growth	LOEC	Whole Organism	L	6		NC	ug/L	LAB	2006. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Toxicity of Silver in Water and Sediment to the Freshwater Amphipod Hyalella azteca. Environ. Toxicol. Chem.25(7): 1802-1808.
Silver	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	F	4500	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Silver	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.25	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Silver	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.05	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	L	5.4		NC	ug/L	LAB	2006. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Toxicity of Silver in Water and Sediment to the Freshwater Amphipod Hyalella azteca. Environ. Toxicol. Chem.25(7): 1802-1808.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5.4		NC	ug/L	LAB	2006. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Toxicity of Silver in Water and Sediment to the Freshwater Amphipod Hyalella azteca. Environ. Toxicol. Chem.25(7): 1802-1808.
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.2	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5.8	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.1	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.1	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.9	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.8	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	1.9	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	4	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	0.9	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	L	12		NC	ug/L	LAB	2006. Call, D.J., C.N. Polkinghorne, T.P. Markee, L.T. Brooke, D.L. Geiger, J.W. Gorsuch, and K.A. Robillard. Toxicity of Silver in Water and Sediment to the Freshwater Amphipod Hyalella azteca. Environ. Toxicol. Chem.25(7): 1802-1808.
Nitric acid, silver (1+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	83	NA	NR	ug/L	LAB	1987. Holcombe, G.W., G.L. Phipps, A.H. Sulaiman, and A.D. Hoffman. Simultaneous Multiple Species Testing: Acute Toxicity of 13 Chemicals to 12 Diverse Freshwater Amphibian, Fish, and Invertebrate Families. Arch. Environ. Contam. Toxicol.16: 697-710.
Nitric acid, silver (1+) salt	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	241	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Silver	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	8.8	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, silver (1+) salt	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2.5	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	8.8	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Nitric acid, silver (1+) salt	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Nitric acid, silver (1+) salt	Stonefly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Nitric acid, silver (1+) salt	Stonefly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Nehring, R.B.. Aquatic Insects as Biological Monitors of Heavy Metal Pollution. Bull. Environ. Contam. Toxicol.15(2): 147-154.
Nitric acid, silver (1+) salt	Stonefly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	43	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Nitric acid, silver (1+) salt	Stonefly	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	28	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Growth	EC20	Not Reported	T	6.42		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Growth	EC20	Not Reported	T	7.56		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Growth	EC50	Not Reported	T	8.02		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Growth	EC50	Not Reported	T	8.57		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Growth	IC20	Whole Organism	D	3.55		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	D	3.79		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Growth	MATC	Whole Organism	D	3		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	D	2.37		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Silver	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	T	1		NC	ug/L	LAB	2004. Glover, C.N., and C.M. Wood. Physiological Interactions of Silver and Humic Substances in Daphnia magna: Effects on Reproduction and Silver Accumulation Following an Acute Silver Challenge. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.139(4): 273-280.
Silver	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	T	1		NC	ug/L	LAB	2004. Glover, C.N., and C.M. Wood. Physiological Interactions of Silver and Humic Substances in Daphnia magna: Effects on Reproduction and Silver Accumulation Following an Acute Silver Challenge. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.139(4): 273-280.
Silver	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	T	1		NC	ug/L	LAB	2004. Glover, C.N., and C.M. Wood. Physiological Interactions of Silver and Humic Substances in Daphnia magna: Effects on Reproduction and Silver Accumulation Following an Acute Silver Challenge. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.139(4): 273-280.
Silver	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	T	1		NC	ug/L	LAB	2004. Glover, C.N., and C.M. Wood. Physiological Interactions of Silver and Humic Substances in Daphnia magna: Effects on Reproduction and Silver Accumulation Following an Acute Silver Challenge. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.139(4): 273-280.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Growth	NOEL	Not Reported	T	5.03		NC	ug/L	LAB	2002. Bianchini, A., and C.M. Wood. Physiological Effects of Chronic Silver Exposure in Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 137-145.
Silver	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	0.24	NR	NR	ug/L	LAB	1980. Chapman, G.A.. Metal Toxicity Tests. July 14, 1980 Memo to Quentin Pickering, Newtown Fish Toxicology Station: 2 p..
Silver	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	9.5	NR	NR	ug/L	LAB	1980. Chapman, G.A.. Metal Toxicity Tests. July 14, 1980 Memo to Quentin Pickering, Newtown Fish Toxicology Station: 2 p..
Silver	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	0.24	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Silver	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	9.5	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	16		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	10.42	D	1.82	nM	LAB	2008. Kolts, J.M., M.L. Brooks, B.D. Cantrell, C.J. Boese, R.A. Bell, and J.S. Meyer. Dissolved Fraction of Standard Laboratory Cladoceran Food Alters Toxicity of Waterborne Silver to Ceriodaphnia dubia. Environ. Toxicol. Chem.27(6): 1426-1434.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	2.17	D	1.73	nM	LAB	2008. Kolts, J.M., M.L. Brooks, B.D. Cantrell, C.J. Boese, R.A. Bell, and J.S. Meyer. Dissolved Fraction of Standard Laboratory Cladoceran Food Alters Toxicity of Waterborne Silver to Ceriodaphnia dubia. Environ. Toxicol. Chem.27(6): 1426-1434.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	2.6	D	2.02	nM	LAB	2008. Kolts, J.M., M.L. Brooks, B.D. Cantrell, C.J. Boese, R.A. Bell, and J.S. Meyer. Dissolved Fraction of Standard Laboratory Cladoceran Food Alters Toxicity of Waterborne Silver to Ceriodaphnia dubia. Environ. Toxicol. Chem.27(6): 1426-1434.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	3.96	D	2.78	nM	LAB	2008. Kolts, J.M., M.L. Brooks, B.D. Cantrell, C.J. Boese, R.A. Bell, and J.S. Meyer. Dissolved Fraction of Standard Laboratory Cladoceran Food Alters Toxicity of Waterborne Silver to Ceriodaphnia dubia. Environ. Toxicol. Chem.27(6): 1426-1434.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	5.21	D	3.05	nM	LAB	2008. Kolts, J.M., M.L. Brooks, B.D. Cantrell, C.J. Boese, R.A. Bell, and J.S. Meyer. Dissolved Fraction of Standard Laboratory Cladoceran Food Alters Toxicity of Waterborne Silver to Ceriodaphnia dubia. Environ. Toxicol. Chem.27(6): 1426-1434.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	57.9	D	53.2	nM	LAB	2008. Kolts, J.M., M.L. Brooks, B.D. Cantrell, C.J. Boese, R.A. Bell, and J.S. Meyer. Dissolved Fraction of Standard Laboratory Cladoceran Food Alters Toxicity of Waterborne Silver to Ceriodaphnia dubia. Environ. Toxicol. Chem.27(6): 1426-1434.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	6.48	D	4.76	nM	LAB	2008. Kolts, J.M., M.L. Brooks, B.D. Cantrell, C.J. Boese, R.A. Bell, and J.S. Meyer. Dissolved Fraction of Standard Laboratory Cladoceran Food Alters Toxicity of Waterborne Silver to Ceriodaphnia dubia. Environ. Toxicol. Chem.27(6): 1426-1434.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	6.86	D	5.05	nM	LAB	2008. Kolts, J.M., M.L. Brooks, B.D. Cantrell, C.J. Boese, R.A. Bell, and J.S. Meyer. Dissolved Fraction of Standard Laboratory Cladoceran Food Alters Toxicity of Waterborne Silver to Ceriodaphnia dubia. Environ. Toxicol. Chem.27(6): 1426-1434.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	60.8	D	59.6	nM	LAB	2008. Kolts, J.M., M.L. Brooks, B.D. Cantrell, C.J. Boese, R.A. Bell, and J.S. Meyer. Dissolved Fraction of Standard Laboratory Cladoceran Food Alters Toxicity of Waterborne Silver to Ceriodaphnia dubia. Environ. Toxicol. Chem.27(6): 1426-1434.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	9.35	D	7.93	nM	LAB	2008. Kolts, J.M., M.L. Brooks, B.D. Cantrell, C.J. Boese, R.A. Bell, and J.S. Meyer. Dissolved Fraction of Standard Laboratory Cladoceran Food Alters Toxicity of Waterborne Silver to Ceriodaphnia dubia. Environ. Toxicol. Chem.27(6): 1426-1434.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	6.4	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4):
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	3.6	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4):
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	2.7	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4):
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	0.06		NC	ug/L	LAB	2005. Tsui, M.T.K., W.X. Wang, and L.M. Chu. Influence of Glyphosate and Its Formulation (Roundup) on the Toxicity and Bioavailability of Metals to Ceriodaphnia dubia. Environ. Pollut.138(1): 59-68.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC20	Not Reported	T	2.12		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC20	Not Reported	T	6.41		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Silver	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	11	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Silver	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.5	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Silver	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.5	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Silver	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Silver	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.5		NC	ug/L	LAB	2002. Bielmyer, G.K., R.A. Bell, and S.J. Klaine. Effects of Ligand-Bound Silver on Ceriodaphnia dubia. Environ. Toxicol. Chem.21(10): 2204-2208.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.55		NC	ug/L	LAB	2002. Bielmyer, G.K., R.A. Bell, and S.J. Klaine. Effects of Ligand-Bound Silver on Ceriodaphnia dubia. Environ. Toxicol. Chem.21(10): 2204-2208.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	160		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	12.92		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	14.15		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	13.1		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.32		NC	ug/L	LAB	2002. Bielmyer, G.K., R.A. Bell, and S.J. Klaine. Effects of Ligand-Bound Silver on Ceriodaphnia dubia. Environ. Toxicol. Chem.21(10): 2204-2208.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.92	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.79	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.92	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.26		NC	ug/L	LAB	2002. Bianchini, A., M. Grosell, S.M. Gregory, and C.M. Wood. Acute Silver Toxicity in Aquatic Animals is a Function of Sodium Uptake Rate. Environ. Sci. Technol.36(8): 1763-1766.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.47		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.2		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.79		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.79		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.88		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.2		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.18		NC	ug/L	LAB	2002. Bianchini, A., K.C. Bowles, C.J. Brauner, J.W. Gorsuch, J.R. Kramer, and C.M. Wood. Evaluation of the Effect of Reactive Sulfide on the Acute Toxicity of Silver (I) to Daphnia magna. Part 2: Toxicity Results. Environ. Toxicol. Chem.21(6): 1294-1300.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.26		NC	ug/L	LAB	2002. Bianchini, A., K.C. Bowles, C.J. Brauner, J.W. Gorsuch, J.R. Kramer, and C.M. Wood. Evaluation of the Effect of Reactive Sulfide on the Acute Toxicity of Silver (I) to Daphnia magna. Part 2: Toxicity Results. Environ. Toxicol. Chem.21(6): 1294-1300.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.7		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6.57		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	42	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.06	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	55	NR	NR	ug/L	LAB	1999. Sankaramanachi, S.K., and S.R. Qasim. Metal Toxicity Evaluation Using Bioassay and Microtox. Int. J. Environ. Stud.56(2): 187-199.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.578	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.844	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.941	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.009	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.01	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.138	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.27	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.37	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.374	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.393	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.443	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.466	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.479	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.532	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.559	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.666	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.774	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.993	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.006	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.039	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.317	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.502	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.503	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.513	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.561	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.595	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.641	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.74	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.947	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.124	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.256	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.794	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.58	NA	NR	ug/L	LAB	1998. Erickson, R.J., L.T. Brooke, M.D. Kahl, F.V. Venter, S.L. Harting, T.P. Markee, and R.L. Spehar. Effects of Laboratory Test Conditions on the Toxicity of Silver to Aquatic Organisms. Environ. Toxicol. Chem.17(4): 572-578.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35	NA	NR	ug/L	LAB	1998. Erickson, R.J., L.T. Brooke, M.D. Kahl, F.V. Venter, S.L. Harting, T.P. Markee, and R.L. Spehar. Effects of Laboratory Test Conditions on the Toxicity of Silver to Aquatic Organisms. Environ. Toxicol. Chem.17(4): 572-578.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Erickson, R.J., L.T. Brooke, M.D. Kahl, F.V. Venter, S.L. Harting, T.P. Markee, and R.L. Spehar. Effects of Laboratory Test Conditions on the Toxicity of Silver to Aquatic Organisms. Environ. Toxicol. Chem.17(4): 572-578.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Erickson, R.J., L.T. Brooke, M.D. Kahl, F.V. Venter, S.L. Harting, T.P. Markee, and R.L. Spehar. Effects of Laboratory Test Conditions on the Toxicity of Silver to Aquatic Organisms. Environ. Toxicol. Chem.17(4): 572-578.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Erickson, R.J., L.T. Brooke, M.D. Kahl, F.V. Venter, S.L. Harting, T.P. Markee, and R.L. Spehar. Effects of Laboratory Test Conditions on the Toxicity of Silver to Aquatic Organisms. Environ. Toxicol. Chem.17(4): 572-578.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.64	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.66	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.9	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.03	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.07	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14.9	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.2	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.9	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	45	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	49	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8.4	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.39	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10*	NA	NR	ug/L	LAB	1986. Ziegenfuss, P.S., W.J. Renaudette, and W.J. Adams. Methodology for Assessing the Acute Toxicity of Chemicals Sorbed to Sediments: Testing the Equilibrium Partitioning Theory. In: T.M.Poston and R.Purdy (Eds.), Aquatic Toxicology and Environmental Fate, 9th Volume, ASTM STP 921, Philadelphia, PA: 479-493.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.06	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.31		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.65		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.9		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.08		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.12		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.12		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.22		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.33		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.85		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2.6		NC	ug/L	LAB	2002. Bury, N.R., J. Shaw, C. Glover, and C. Hogstrand. Derivation of a Toxicity-Based Model to Predict how Water Chemistry Influences Silver Toxicity to Invertebrates. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 259-270.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	40		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	8		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Silver chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.82	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Silver chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.72	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Silver chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7.85	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Silver	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	30000	NR	NR	ug/L	LAB	1960. Bringmann, G., and R. Kuhn. The Water-Toxicological Detection of Insecticides (Zum Wasser-Toxikologischen Nachweis von Insektiziden). Gesund. -Ing.8: 243-244.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	15.9		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	16.1		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	35		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	15.9		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	20		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	13.1	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	2.6	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	5.2	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Silver	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	1.1	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	11.5		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	22.4		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	11.5		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	3.69		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	3.69		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	11.4		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	10		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	3.79		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Silver	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	6400		NC	ug/L	LAB	1996. Schmittschmitt, J.P., J.R. Shaw, and W.J. Birge. The Effects of Silver on Green Algae and Prospects for Trophic Transfer. In: A.W.Andren and T.W.Bober (Eds.), 4th Int.Conf.Proc., Transport, Fate and Effects of Silver in the Environment, August 25-28, Madison, WI: 245-
Silver	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	0.75	NR	NR	ug/L	LAB	1980. Chapman, G.A.. Metal Toxicity Tests. July 14, 1980 Memo to Quentin Pickering, Newtown Fish Toxicology Station: 2 p..
Silver	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	36.4	NR	NR	ug/L	LAB	1980. Chapman, G.A.. Metal Toxicity Tests. July 14, 1980 Memo to Quentin Pickering, Newtown Fish Toxicology Station: 2 p..

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	0.5		NC	ug/L	LAB	2002. Bianchini, A., K.C. Bowles, C.J. Brauner, J.W. Gorsuch, J.R. Kramer, and C.M. Wood. Evaluation of the Effect of Reactive Sulfide on the Acute Toxicity of Silver (I) to Daphnia magna. Part 2: Toxicity Results. Environ. Toxicol. Chem.21(6): 1294-1300.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	100		NC	nM	LAB	1997. Fisher, N.S., and S.E. Hook. Silver Accumulation and Toxicity in Marine and Freshwater Zooplankton. In: A.W.Andren and T.W.Bober (Eds.), Proc.of the 5th Int.Conf.on the Transport, Fate and Effects of Silver in the Environment, Sept.28-Oct.1, 1997, Hamilton, Ont., Canada: 265-273.
Silver	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	1		NC	ug/L	LAB	2004. Glover, C.N., and C.M. Wood. Physiological Interactions of Silver and Humic Substances in Daphnia magna: Effects on Reproduction and Silver Accumulation Following an Acute Silver Challenge. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.139(4): 273-
Silver	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.07	NR	NR	ug/L	LAB	1980. Chapman, G.A.. Metal Toxicity Tests. July 14, 1980 Memo to Quentin Pickering, Newtown Fish Toxicology Station: 2 p..
Silver	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.9	NR	NR	ug/L	LAB	1980. Chapman, G.A.. Metal Toxicity Tests. July 14, 1980 Memo to Quentin Pickering, Newtown Fish Toxicology Station: 2 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	D	11.4		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	1.94		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	14.9		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	3.2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	0.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC20	Not Reported	T	5.43		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC20	Not Reported	T	5.57		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50		T	0.8	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4):
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	5.51		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	5.87		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.04		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.1		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.17		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.42		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.52		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.61		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.63		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.66		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.93		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.96		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.1		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	6.17		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50		T	2.2	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4):
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	EC50		T	1.2	NA	NR	ug/L	LAB	1986. Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. Relative Sensitivity of Three Daphnid Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem.5(4):
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	IC20	Progeny	D	10.02		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	IC20	Progeny	D	7.72		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	IC20	Progeny	D	2.65		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Progeny	D	11900		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Progeny	T	3.2		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	IC50	Not Reported	T	1.7	NR	NR	ng/d	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Silver	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1300		NC	ug/L	LAB	1996. Schmittschmitt, J.P., J.R. Shaw, and W.J. Birge. The Effects of Silver on Green Algae and Prospects for Trophic Transfer. In: A.W.Andren and T.W.Bober (Eds.), 4th Int.Conf.Proc., Transport, Fate and Effects of Silver in the Environment, August 25-28, Madison, WI: 245-
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	0.01		NC	ug/L	LAB	2002. Bielmyer, G.K., R.A. Bell, and S.J. Klaine. Effects of Ligand-Bound Silver on Ceriodaphnia dubia. Environ. Toxicol. Chem.21(10): 2204-2208.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Progeny	D	7600		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Progeny	D	11.5		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Progeny	D	15.9		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Progeny	D	5.51		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Progeny	T	22.4		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Progeny	T	5		NC	ug/L	LAB	2004. Sofyan, A.. Toxicity of Metals to Green Algae and Ceriodaphnia dubia: The Importance of Water Column and Dietary Exposures. Ph.D.Thesis, Univ.of Kentucky, Lexington, KY: 161 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1.14	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Progeny	D	3.79		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1.22	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	3.2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	0.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	D	26.9		NC	nM	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	D	31.3		NC	nM	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	5.03		NC	ug/L	LAB	2002. Bianchini, A., and C.M. Wood. Physiological Effects of Chronic Silver Exposure in Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 137-145.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Progeny	D	4.8		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Progeny	D	9.61		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Progeny	D	3		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	13.1	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	2.6	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	5.2	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Silver	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1100		NC	ug/L	LAB	1996. Schmittschmitt, J.P., J.R. Shaw, and W.J. Birge. The Effects of Silver on Green Algae and Prospects for Trophic Transfer. In: A.W.Andren and T.W.Bober (Eds.), 4th Int.Conf.Proc., Transport, Fate and Effects of Silver in the Environment, August 25-28, Madison, WI: 245-
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	0.001		NC	ug/L	LAB	2002. Bielmyer, G.K., R.A. Bell, and S.J. Klaine. Effects of Ligand-Bound Silver on Ceriodaphnia dubia. Environ. Toxicol. Chem.21(10): 2204-2208.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Progeny	T	3.69		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Progeny	T	3.69		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Progeny	D	11.5		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Progeny	D	4.19		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Progeny	T	14.9		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Progeny	D	8.01		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	0.53	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Progeny	D	2.37		NC	ug/L	LAB	2007. Naddy, R.B., J.W. Gorsuch, A.B. Rehner, G.R. McNerney, R.A. Bell, and J.R. Kramer. Chronic Toxicity of Silver Nitrate to Ceriodaphnia dubia and Daphnia magna, and Potential Mitigating Factors. Aquat. Toxicol.84(1): 1-10.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	0.8	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	0.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..

Table B-23. Summary of Results from the EcoTox Database for Invertebrates - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	0.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Silver	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Progeny	T	1		NC	ug/L	LAB	2004. Glover, C.N., and C.M. Wood. Physiological Interactions of Silver and Humic Substances in Daphnia magna: Effects on Reproduction and Silver Accumulation Following an Acute Silver Challenge. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.139(4): 273-
Silver	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Progeny	T	1		NC	ug/L	LAB	2004. Glover, C.N., and C.M. Wood. Physiological Interactions of Silver and Humic Substances in Daphnia magna: Effects on Reproduction and Silver Accumulation Following an Acute Silver Challenge. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.139(4): 273-
Silver	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Progeny	T	1		NC	ug/L	LAB	2004. Glover, C.N., and C.M. Wood. Physiological Interactions of Silver and Humic Substances in Daphnia magna: Effects on Reproduction and Silver Accumulation Following an Acute Silver Challenge. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.139(4): 273-
Silver	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Progeny	T	1		NC	ug/L	LAB	2004. Glover, C.N., and C.M. Wood. Physiological Interactions of Silver and Humic Substances in Daphnia magna: Effects on Reproduction and Silver Accumulation Following an Acute Silver Challenge. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.139(4): 273-
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	2318		NC	nmol/g	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	2818		NC	mol/g foc	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	2820		NC	nmol/g	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	4320		NC	nmol/g	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	436		NC	nmol/g	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	7270		NC	mol/g foc	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	812		NC	nmol/g	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	D	13		NC	nM	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	D	14.2		NC	nM	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	3.39		NC	nM	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.
Nitric acid, silver (1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	3.39		NC	nM	LAB	2009. Kolts, J.M., C.J. Boese, and J.S. Meyer. Effects of Dietborne Copper and Silver on Reproduction by Ceriodaphnia dubia. Environ. Toxicol. Chem.28(1): 71-85.

Table B-24. Summary of Results from the EcoTox Database for Invertebrates - Strontium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Strontium	Amphipod	Crustaceans	Fresh	Mortality	LC50		A	NR			ug/L	LAB	. . . .
Strontium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	320000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Strontium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	390000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Strontium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	440000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Strontium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	720000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Strontium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	860000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Strontium chloride	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	910000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Strontium chloride	Freshwater Sponge	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	mM	LAB	1978. Ostrom, K.M., and T.L. Simpson. Calcium and the Release From Dormancy of Freshwater Sponge Gemmules. Dev. Biol.64: 332-338.
Strontium chloride	Freshwater Sponge	Invertebrates	Fresh	Reproduction	NR	Not Reported	T	1	NA	NR	mM	LAB	1978. Ostrom, K.M., and T.L. Simpson. Calcium and the Release From Dormancy of Freshwater Sponge Gemmules. Dev. Biol.64: 332-338.
Strontium nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	181	L	118	mM	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Strontium nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	10806000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Strontium nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2930000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Strontium nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	725000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Strontium nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	465000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Strontium nitrate	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	3500000	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Strontium chloride	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	6600000	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Strontium chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	75000	NA	NR	ug/L	LAB	1974. Baudouin, M.F., and P. Scoppa. Acute Toxicity of Various Metals to Freshwater Zooplankton. Bull. Environ. Contam. Toxicol.12(6): 745-751.
Strontium chloride	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	60000	NA	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

Table B-25. Summary of Results from the EcoTox Database for Invertebrates - Thallium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Thallium	Amphipod	Crustaceans	Fresh	Mortality	LC50		AM	46			ug/L	LAB	. . . .
Sulfuric acid, Dithallium(1+) salt	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.8	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.
Sulfuric acid, Dithallium(1+) salt	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	229000	NR	NR	ug/L	LAB	1983. Horne, J.D., M.A. Swirsky, T.A. Hollister, B.R. Oblad, and J.H. Kennedy. 5Aquatic Toxicity Studies of Five Priority Pollutants. Rep.No.4398, Final Report, EPA Contract No.68-01-6201, NUS Corp., Houston, TX: 196 p..
Sulfuric acid, Dithallium(1+) salt	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	474300	NR	NR	ug/L	LAB	1983. Horne, J.D., M.A. Swirsky, T.A. Hollister, B.R. Oblad, and J.H. Kennedy. 5Aquatic Toxicity Studies of Five Priority Pollutants. Rep.No.4398, Final Report, EPA Contract No.68-01-6201, NUS Corp., Houston, TX: 196 p..
Sulfuric acid, Dithallium(1+) salt	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	474300	NR	NR	ug/L	LAB	1983. Horne, J.D., M.A. Swirsky, T.A. Hollister, B.R. Oblad, and J.H. Kennedy. 5Aquatic Toxicity Studies of Five Priority Pollutants. Rep.No.4398, Final Report, EPA Contract No.68-01-6201, NUS Corp., Houston, TX: 196 p..
Sulfuric acid, Dithallium(1+) salt	Midge	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	102500	NR	NR	ug/L	LAB	1983. Horne, J.D., M.A. Swirsky, T.A. Hollister, B.R. Oblad, and J.H. Kennedy. 5Aquatic Toxicity Studies of Five Priority Pollutants. Rep.No.4398, Final Report, EPA Contract No.68-01-6201, NUS Corp., Houston, TX: 196 p..
Sulfuric acid, Dithallium(1+) salt	Midge	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	T	102500	NR	NR	ug/L	LAB	1983. Horne, J.D., M.A. Swirsky, T.A. Hollister, B.R. Oblad, and J.H. Kennedy. 5Aquatic Toxicity Studies of Five Priority Pollutants. Rep.No.4398, Final Report, EPA Contract No.68-01-6201, NUS Corp., Houston, TX: 196 p..
Thallium	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	194000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Thallium	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	172000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Thallium	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	123000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Sulfuric acid, Dithallium(1+) salt	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2700	NR	NR	ug/L	LAB	1983. Horne, J.D., M.A. Swirsky, T.A. Hollister, B.R. Oblad, and J.H. Kennedy. 5Aquatic Toxicity Studies of Five Priority Pollutants. Rep.No.4398, Final Report, EPA Contract No.68-01-6201, NUS Corp., Houston, TX: 196 p..
Sulfuric acid, Dithallium(1+) salt	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	18.8	NA	NR	umol/L	LAB	1994. Calleja, M.C., G. Persoone, and P. Geladi. Comparative Acute Toxicity of the First 50 Multicentre Evaluation of In Vitro Cytotoxicity Chemicals to Aquatic Non-vertebrates. Arch. Environ. Contam. Toxicol.26(1): 69-78.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Growth	EC25	Not Reported	T	33	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Growth	EC25	Not Reported	T	36	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Growth	EC25	Not Reported	T	36	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Growth	EC25	Not Reported	T	37	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Growth	EC25	Not Reported	T	8.6	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	380	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	53	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	63	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	66	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC25	Not Reported	T	12	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC25	Not Reported	T	22	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.

Table B-25. Summary of Results from the EcoTox Database for Invertebrates - Thallium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC25	Not Reported	T	36	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC25	Not Reported	T	73	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC25	Not Reported	T	93	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Thallium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Sulfuric acid, Dithallium(1+) salt	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1983. Horne, J.D., M.A. Swirsky, T.A. Hollister, B.R. Oblad, and J.H. Kennedy. 5Aquatic Toxicity Studies of Five Priority Pollutants. Rep.No.4398, Final Report, EPA Contract No.68-01-6201, NUS Corp., Houston, TX: 196 p..
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	190	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	290	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	310	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	420	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	86	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	98	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Reproduction	EC25	Not Reported	T	18	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Reproduction	EC25	Not Reported	T	2.5	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Thallous(I) nitrate	Scud	Crustaceans	Fresh	Reproduction	EC25	Not Reported	T	26	NR	NR	nmol/L	LAB	1998. Borgmann, U., V. Cheam, W.P. Norwood, and J. Lechner. Toxicity and Bioaccumulation of Thallium in Hyalella azteca, with Comparison to Other Metals and Prediction of Environmental Impact. Environ. Pollut.99(1): 105-114.
Sulfuric acid, Dithallium(1+) salt	Stonefly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1460000	NR	NR	ug/L	LAB	1983. Horne, J.D., M.A. Swirsky, T.A. Hollister, B.R. Oblad, and J.H. Kennedy. 5Aquatic Toxicity Studies of Five Priority Pollutants. Rep.No.4398, Final Report, EPA Contract No.68-01-6201, NUS Corp., Houston, TX: 196 p..
Thallium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	A	3600	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Thallium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.

Table B-25. Summary of Results from the EcoTox Database for Invertebrates - Thallium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1060	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	880	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	920	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	930	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	393	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	630	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	720	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	520	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Thallium chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	138	NR	NR	ug/L	LAB	2005. Lan, C.H., and T.S. Lin. Acute Toxicity of Trivalent Thallium Compounds to Daphnia magna. Ecotoxicol. Environ. Saf.61(3): 432-435.
Thallium chloride	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	61	NR	NR	ug/L	LAB	2005. Lan, C.H., and T.S. Lin. Acute Toxicity of Trivalent Thallium Compounds to Daphnia magna. Ecotoxicol. Environ. Saf.61(3): 432-435.
Thallous(I) nitrate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	52	NR	NR	ug/L	LAB	2005. Lan, C.H., and T.S. Lin. Acute Toxicity of Trivalent Thallium Compounds to Daphnia magna. Ecotoxicol. Environ. Saf.61(3): 432-435.
Thallous(I) nitrate	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	24	NR	NR	ug/L	LAB	2005. Lan, C.H., and T.S. Lin. Acute Toxicity of Trivalent Thallium Compounds to Daphnia magna. Ecotoxicol. Environ. Saf.61(3): 432-435.
Thallium	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	1700	NA	NR	ug/L	LAB	1980. LeBlanc, G.A.. Acute Toxicity of Priority Pollutants to Water Flea (Daphnia magna). Bull. Environ. Contam. Toxicol.24(5): 684-691.
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	509000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1400	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	181	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	300	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	135	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	170	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..

Table B-25. Summary of Results from the EcoTox Database for Invertebrates - Thallium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Dithallium(1+) salt	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	181	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

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Table B-26. Summary of Results from the EcoTox Database for Invertebrates - Thorium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Thorium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5.2	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

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Table B-27. Summary of Results from the EcoTox Database for Invertebrates - Uranium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Uranium	Amphipod	Crustaceans	Fresh	Mortality	LC50		AN	1651			ug/L	LAB	. . . .
Bis(nitrato-o,o')dioxouranium	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	50000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	50000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Uranium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Uranium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1651	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Dioxo[sulfato(2-)-O,O']-uranium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17300	L	0.0012	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Dioxo[sulfato(2-)-O,O']-uranium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	25400	L	0.0015	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Dioxo[sulfato(2-)-O,O']-uranium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5870	L	0.006	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Dioxo[sulfato(2-)-O,O']-uranium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	9360	L	0.007	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Uranium oxide	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1993. Pickett, J.B., W.L. Specht, and J.L. Keyes. Acute and Chronic Toxicity of Uranium Compounds to Ceriodaphnia-Daphnia dubia. U.S.Dep.Energy, WSRC-RP-92-995, Westinghouse Savannah River Company, Aiken, SC: 403 p..
Uranium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32700		NC	ug/L	LAB	1984. Vinot, H., and J.P. Larpent. Water Pollution by Uranium Ore Treatment Works. Hydrobiologia112: 125-129.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	60	NA	NR	ug/L	LAB	1993. Pickett, J.B., W.L. Specht, and J.L. Keyes. Acute and Chronic Toxicity of Uranium Compounds to Ceriodaphnia-Daphnia dubia. U.S.Dep.Energy, WSRC-RP-92-995, Westinghouse Savannah River Company, Aiken, SC: 403 p..
Dioxo[sulfato(2-)-O,O']-uranium	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	200	NA	NR	ug/L	LAB	1993. Hyne, R.V., A. Padovan, D.L. Parry, and S.M. Renaud. Increased Fecundity of the Cladoceran Moinodaphnia macleayi on a Diet Supplemented with a Green Alga, and Its Use in Uranium Toxicity Tests. Aust. J. Mar. Freshw. Res.44(3): 389-399.
Dioxo[sulfato(2-)-O,O']-uranium	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	25	NA	NR	ug/L	LAB	1993. Hyne, R.V., A. Padovan, D.L. Parry, and S.M. Renaud. Increased Fecundity of the Cladoceran Moinodaphnia macleayi on a Diet Supplemented with a Green Alga, and Its Use in Uranium Toxicity Tests. Aust. J. Mar. Freshw. Res.44(3): 389-399.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	2.7	NA	NR	ug/L	LAB	1993. Pickett, J.B., W.L. Specht, and J.L. Keyes. Acute and Chronic Toxicity of Uranium Compounds to Ceriodaphnia-Daphnia dubia. U.S.Dep.Energy, WSRC-RP-92-995, Westinghouse Savannah River Company, Aiken, SC: 403 p..
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	2	NA	NR	ug/L	LAB	1993. Pickett, J.B., W.L. Specht, and J.L. Keyes. Acute and Chronic Toxicity of Uranium Compounds to Ceriodaphnia-Daphnia dubia. U.S.Dep.Energy, WSRC-RP-92-995, Westinghouse Savannah River Company, Aiken, SC: 403 p..
Dioxo[sulfato(2-)-O,O']-uranium	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Hyne, R.V., A. Padovan, D.L. Parry, and S.M. Renaud. Increased Fecundity of the Cladoceran Moinodaphnia macleayi on a Diet Supplemented with a Green Alga, and Its Use in Uranium Toxicity Tests. Aust. J. Mar. Freshw. Res.44(3): 389-399.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	1.5	NA	NR	ug/L	LAB	1993. Pickett, J.B., W.L. Specht, and J.L. Keyes. Acute and Chronic Toxicity of Uranium Compounds to Ceriodaphnia-Daphnia dubia. U.S.Dep.Energy, WSRC-RP-92-995, Westinghouse Savannah River Company, Aiken, SC: 403 p..
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	3540	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	390	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.

Table B-27. Summary of Results from the EcoTox Database for Invertebrates - Uranium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2250	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1290	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	740	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1290	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	740	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2250	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	3540	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2250	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	3540	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	390	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2250	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	520	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	860	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	3540	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	2250	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1440	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	1290	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	1290	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	2250	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	2250	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	520	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	520	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.

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Table B-28. Summary of Results from the EcoTox Database for Invertebrates - Vanadium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Vanadium	Amphipod	Crustaceans	Fresh	Mortality	LC50		AN	1032			ug/L	LAB	. . . .
Vanadium pentoxide	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	240	NR	NR	ug/L	LAB	1997. Fargasova, A.. Sensitivity of Chironomus plumosus Larvae to V5+, Mo6+, Mn2+, Ni2+, Cu2+, and Cu+ Metal Ions and Their Combinations. Bull. Environ. Contam. Toxicol.59(1): 956-962.
Vanadium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1251	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Vanadium	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1032	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Vanadium pentoxide	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	578	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Vanadium pentoxide	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Vanadium pentoxide	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	211	NR	NR	ug/L	LAB	1999. Fargasova, A.. Ecotoxicology of Metals Related to Freshwater Benthos. Gen. Physiol. Biophys.18(Focus Issue): 48-53.
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1370	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1460	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1520	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1580	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	940	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1030	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	850	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	790	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	4500	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Vanadium	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1700	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	2000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	1000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	700	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Amoeba	Invertebrates	Fresh	Mortality	NR	Not Reported	T	1000000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Zinc chloride (ZnCl2)	Amphipod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	25900	NA	NR	ug/L	LAB	1997. Pantani, C., G. Pannunzio, M. De Cristofaro, A.A. Novelli, and M. Salvatori. Comparative Acute Toxicity of Some Pesticides, Metals, and Surfactants to Gammarus italicus Goedm. and Echinogammarus tibaldii Pink. and Stock (Crustacea: Amphipoda). Bull. Environ. Contam. Toxicol.59(6): 963-967.
Zinc	Amphipod	Crustaceans	Fresh	Mortality	LC50		AM	222			ug/L	LAB	. . . .
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	409625	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1522	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	38500	NR	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	56000	NR	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1100*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	13000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	23000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8300	NR	NR	ug/L	LAB	Chlorine to Epigean and Hypogean Isopods (Asellidae). Natl. Speleological Soc. Bull.43: 12-18.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8450	NR	NR	ug/L	LAB	Chlorine to Epigean and Hypogean Isopods (Asellidae). Natl. Speleological Soc. Bull.43: 12-18.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	409625	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	54050*	NA	NR	ug/L	LAB	1979. Furmanska, M.. Studies of the Effect of Copper, Zinc, and Iron on the Biotic Components of Aquatic Ecosystems. Pol. Arch. Hydrobiol.26(1-2): 213-220.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	15220	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	25000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	1000000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	10000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	50	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	4.1E+08	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Aquatic Sowbug	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	1522000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Asiatic Clam	Molluscs	Fresh	Mortality	LC50	Not Reported	T	6040	NA	NR	ug/L	LAB	1980. Cherry, D.S., J.H.,Jr. Rodgers, R.L. Graney, and J.,Jr. Cairns. Dynamics and Control of the Asiatic Clam in the New River, Virginia. Bull. Va. Water Resour. Res. Ctr.123: 72 p..
Zinc chloride (ZnCl2)	Asiatic Clam	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	15.3		NC	uM	LAB	2006. Marie, V., P. Gonzalez, M. Baudrimont, J.P. Bourdineaud, and A. Boudou. Metallothionein Response to Cadmium and Zinc Exposures Compared in Two Freshwater Bivalves, Dreissena polymorpha and Corbicula fluminea. Biometals19(4): 399-407.
Sulfuric acid, Zinc salt (1:1)	Asiatic Clam	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	5000		NC	ug/L	FIELDA	1986. Farris, J.L.. Cellulolytic Responses to Heavy-Metal Accumulation in Corbicula fluminea and Mudalia dilatata. Ph.D.Thesis, Va.Polytechnic Inst.and State Univ., Blacksburg, VA: 185
Sulfuric acid, Zinc salt (1:1)	Asiatic Clam	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	40000		NC	ug/L	LAB	1986. Farris, J.L.. Cellulolytic Responses to Heavy-Metal Accumulation in Corbicula fluminea and Mudalia dilatata. Ph.D.Thesis, Va.Polytechnic Inst.and State Univ., Blacksburg, VA: 185
Zinc	Beer Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	5000		NC	ug/L	LAB	2000. Castillo, G., and L. Schafer. Evaluation of a Bioassay Battery for Water Toxicity Testing: A Chilean Experience. Environ. Toxicol.15(4): 331-337.
Sulfuric acid, Zinc salt (1:1)	Beet Nematode	Worms	Fresh	Growth	LOEL	Whole Organism	T	500000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Beet Nematode	Worms	Fresh	Growth	NOEL	Whole Organism	T	50000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Zinc salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	255000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Zinc salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	82000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Zinc salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	39400		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Zinc salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	95100		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Zinc salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	20000		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Zinc salt (1:1)	Beet Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	47500		NC	ug/L	LAB	1982. Haight, M., T. Mudry, and J. Pasternak. Toxicity of Seven Heavy Metals on Panagrellus silusiae: The Efficacy of the Free-Living Nematode as an In Vivo Toxicological Bioassay. Nematologica28: 1-11.
Sulfuric acid, Zinc salt (1:1)	Big Claw River Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1987. Correa, M.. Physiological Effects of Metal Toxicity on the Tropical Freshwater Shrimp Macrobrachium carcinus (Linneo, 1758). Environ. Pollut.45(2): 149-155.
Zinc nitrate	Brown Gardensnail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Laskowski, R., and S.P. Hopkin. Effect of Zn, Cu, Pb and Cd on Fitness in Snails (Helix aspersa). Ecotoxicol. Environ. Saf.34(1): 59-69.
Zinc nitrate	Brown Gardensnail	Molluscs	Fresh	Reproduction	EC50	Not Reported	T	5970000	NR	NR	ug/L	LAB	1996. Laskowski, R., and S.P. Hopkin. Effect of Zn, Cu, Pb and Cd on Fitness in Snails (Helix aspersa). Ecotoxicol. Environ. Saf.34(1): 59-69.
Sulfuric acid, Zinc salt (1:1)	Brown Planaria	Worms	Fresh	Mortality	LC50	Not Reported	T	2680		NC	ug/L	LAB	1998. Safadi, R.S.. The Use of Freshwater Planarians in Acute Toxicity Tests with Heavy Metals. Verh. Int. Ver. Limnol.26(5): 2391-2392.
Zinc	Bryozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5630	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Zinc	Bryozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	4310	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Zinc	Bryozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5300	NA	NR	ug/L	LAB	1980. Pardue, W.J., and T.S. Wood. Baseline Toxicity Data for Freshwater Bryozoa Exposed to Copper, Cadmium, Chromium, and Zinc. J. Tenn. Acad. Sci.55(1): 27-31.
Sulfuric acid, Zinc salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Growth	LOEC	Whole Organism	T	10700		NC	ug/L	LAB	2000. Balch, G.C., R.D. Evans, P. Welbourn, and R. Prairie. Weight Loss and Net Abnormalities of Hydropsyche betteni (Caddisfly) Larvae Exposed to Aqueous Zinc. Environ. Toxicol. Chem.19(12): 3036-3043.
Sulfuric acid, Zinc salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Growth	LOEL	Whole Organism	T	10700		NC	ug/L	LAB	2000. Balch, G.C., R.D. Evans, P. Welbourn, and R. Prairie. Weight Loss and Net Abnormalities of Hydropsyche betteni (Caddisfly) Larvae Exposed to Aqueous Zinc. Environ. Toxicol. Chem.19(12): 3036-3043.
Sulfuric acid, Zinc salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Growth	LOEL	Whole Organism	T	42100		NC	ug/L	LAB	2000. Balch, G.C., R.D. Evans, P. Welbourn, and R. Prairie. Weight Loss and Net Abnormalities of Hydropsyche betteni (Caddisfly) Larvae Exposed to Aqueous Zinc. Environ. Toxicol. Chem.19(12): 3036-3043.
Sulfuric acid, Zinc salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Growth	MATC	Whole Organism	T	30200		NC	ug/L	LAB	2000. Balch, G.C., R.D. Evans, P. Welbourn, and R. Prairie. Weight Loss and Net Abnormalities of Hydropsyche betteni (Caddisfly) Larvae Exposed to Aqueous Zinc. Environ. Toxicol. Chem.19(12): 3036-3043.
Sulfuric acid, Zinc salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Growth	MATC	Whole Organism	T	7600		NC	ug/L	LAB	2000. Balch, G.C., R.D. Evans, P. Welbourn, and R. Prairie. Weight Loss and Net Abnormalities of Hydropsyche betteni (Caddisfly) Larvae Exposed to Aqueous Zinc. Environ. Toxicol. Chem.19(12): 3036-3043.
Sulfuric acid, Zinc salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Growth	NOEC	Whole Organism	T	5400		NC	ug/L	LAB	2000. Balch, G.C., R.D. Evans, P. Welbourn, and R. Prairie. Weight Loss and Net Abnormalities of Hydropsyche betteni (Caddisfly) Larvae Exposed to Aqueous Zinc. Environ. Toxicol. Chem.19(12): 3036-3043.
Sulfuric acid, Zinc salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Growth	NOEL	Whole Organism	T	21700		NC	ug/L	LAB	2000. Balch, G.C., R.D. Evans, P. Welbourn, and R. Prairie. Weight Loss and Net Abnormalities of Hydropsyche betteni (Caddisfly) Larvae Exposed to Aqueous Zinc. Environ. Toxicol. Chem.19(12): 3036-3043.
Sulfuric acid, Zinc salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Growth	NOEL	Whole Organism	T	5400		NC	ug/L	LAB	2000. Balch, G.C., R.D. Evans, P. Welbourn, and R. Prairie. Weight Loss and Net Abnormalities of Hydropsyche betteni (Caddisfly) Larvae Exposed to Aqueous Zinc. Environ. Toxicol. Chem.19(12): 3036-3043.
Sulfuric acid, Zinc salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Mortality	NOEL	Not Reported	T	42100		NC	ug/L	LAB	2000. Balch, G.C., R.D. Evans, P. Welbourn, and R. Prairie. Weight Loss and Net Abnormalities of Hydropsyche betteni (Caddisfly) Larvae Exposed to Aqueous Zinc. Environ. Toxicol. Chem.19(12): 3036-3043.
Sulfuric acid, Zinc salt (1:1)	Caddisfly	Insects/Spiders	Fresh	Mortality	NOEL	Not Reported	T	42100		NC	ug/L	LAB	2000. Balch, G.C., R.D. Evans, P. Welbourn, and R. Prairie. Weight Loss and Net Abnormalities of Hydropsyche betteni (Caddisfly) Larvae Exposed to Aqueous Zinc. Environ. Toxicol. Chem.19(12): 3036-3043.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	62600	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Zinc	Caddisfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	58100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid, Zinc salt (1:1)	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Calanoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Calanoid Copepod	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	45	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Calanoid Copepod	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	45	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Calanoid Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Foster, P.L.. Metal Resistances of Chlorophtya from Rivers Polluted by Heavy Metals. Freshw. Biol.12: 41-61.
Zinc	Chiton	Molluscs	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1993. Tyurin, A.N., and N.K. Khristoforova. Effect of Toxicants on the Development of the Chiton Ischnochiton hakodadensis. Russ.J.Mar.Biol.19(5/6):100-106 / Biol.Morya5-6: 100-106.
Zinc	Chiton	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	200	NA	NR	ug/L	LAB	1993. Tyurin, A.N., and N.K. Khristoforova. Effect of Toxicants on the Development of the Chiton Ischnochiton hakodadensis. Russ.J.Mar.Biol.19(5/6):100-106 / Biol.Morya5-6: 100-106.
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	50000	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1850	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2390	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	10300	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	84700	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3790	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	570	NR	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	LC50*	Not Reported	T	1900	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid, Zinc salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	LETC	Not Reported	T	2700*	NA	NR	ug/L	LAB	1973. Carter, J.W., and I.L. Cameron. Toxicity Bioassay of Heavy Metals in Water Using Tetrahymena-pyriformis. Water Res.7(7): 951-961.
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	1999. Nicolau, A., M. Mota, and N. Lima. Physiological Responses of Tetrahymena pyriformis to Copper, Zinc, Cycloheximide and Triton X-100. FEMS (Fed. Eur. Microbiol. Soc.) Microbiol. Ecol.30: 209-216.
Sulfuric acid, Zinc salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Abraham, J.V., R.D. Butler, and D.C. Sigee. Quantified Elemental Changes in Aspidisca cicada and Vorticella convallaria After Exposure to Aluminium, Copper, and Zinc. Protoplasma198(3-4): 143-154.
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	D	200000	NR	NR	ug/L	LAB	1999. Nicolau, A., M. Mota, and N. Lima. Physiological Responses of Tetrahymena pyriformis to Copper, Zinc, Cycloheximide and Triton X-100. FEMS (Fed. Eur. Microbiol. Soc.) Microbiol. Ecol.30: 209-216.
Sulfuric acid, Zinc salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid, Zinc salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	32000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid, Zinc salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid, Zinc salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	42000	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Sulfuric acid, Zinc salt (1:1)	Ciliate	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	5600	NA	NR	ug/L	LAB	1973. Ruthven, J.A., and J.,Jr. Cairns. The Response of Fresh-Water Protozoan Artificial Communities to Metals. J.Protozool.20(1): 127-135.
Zinc chloride (ZnCl2)	Ciliate	Invertebrates	Fresh	Mortality	NR-ZERO	Not Reported	D	15000	NR	NR	ug/L	LAB	1999. Nicolau, A., M. Mota, and N. Lima. Physiological Responses of Tetrahymena pyriformis to Copper, Zinc, Cycloheximide and Triton X-100. FEMS (Fed. Eur. Microbiol. Soc.) Microbiol. Ecol.30: 209-216.
Zinc chloride (ZnCl2)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	17320		NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Ciliate Protozoa	Invertebrates	Fresh	Mortality	EC50	Not Reported	T	23550		NR	ug/L	LAB	2005. Dayeh, V.R., D.H. Lynn, and N.C. Bols. Cytotoxicity of Metals Common in Mining Effluent to Rainbow Trout Cell Lines and to the Ciliated Protozoan, Tetrahymena thermophila. Toxicol. In Vitro19(3): 399-410.
Sulfuric acid, Zinc salt (1:1)	Ciliate Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	196000	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Zinc chloride (ZnCl2)	Ciliated Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	672	NA	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3):
Sulfuric acid, Zinc salt (1:1)	Ciliated Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	8930	NR	NR	ug/L	LAB	1998. Twagilimana, L., J. Bohatier, CA Groliere, F. Bonnemoy, and D. Sargos. A New Low-Cost Microbiotest with the Protozoan Spirostomum teres: Culture Conditions and Assessment of Sensitivity of the Ciliate to 14 Pure Chemicals. Ecotoxicol. Environ. Saf.41(3): 231-244.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	LOEC	Shell	T	1101	NR	NR	ug/L	LAB	1989. Farris, J.L., S.E. Belanger, D.S. Cherry, and J.,Jr. Cairns. Cellulolytic Activity as a Novel Approach to Assess Long-Term Zinc Stress to Corbicula. Water Res.23(10): 1275-1283.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	LOEC	Shell	T	1101	NR	NR	ug/L	LAB	1989. Farris, J.L., S.E. Belanger, D.S. Cherry, and J.,Jr. Cairns. Cellulolytic Activity as a Novel Approach to Assess Long-Term Zinc Stress to Corbicula. Water Res.23(10): 1275-1283.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	LOEC	Shell	T	34	NR	NR	ug/L	LAB	1989. Farris, J.L., S.E. Belanger, D.S. Cherry, and J.,Jr. Cairns. Cellulolytic Activity as a Novel Approach to Assess Long-Term Zinc Stress to Corbicula. Water Res.23(10): 1275-1283.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	LOEC	Whole Organism	T	1101	NR	NR	ug/L	LAB	1989. Farris, J.L., S.E. Belanger, D.S. Cherry, and J.,Jr. Cairns. Cellulolytic Activity as a Novel Approach to Assess Long-Term Zinc Stress to Corbicula. Water Res.23(10): 1275-1283.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	LOEC	Whole Organism	T	1101	NR	NR	ug/L	LAB	1989. Farris, J.L., S.E. Belanger, D.S. Cherry, and J.,Jr. Cairns. Cellulolytic Activity as a Novel Approach to Assess Long-Term Zinc Stress to Corbicula. Water Res.23(10): 1275-1283.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NOEC	Shell	T	34	NR	NR	ug/L	LAB	1989. Farris, J.L., S.E. Belanger, D.S. Cherry, and J.,Jr. Cairns. Cellulolytic Activity as a Novel Approach to Assess Long-Term Zinc Stress to Corbicula. Water Res.23(10): 1275-1283.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NOEC	Shell	T	34	NR	NR	ug/L	LAB	1989. Farris, J.L., S.E. Belanger, D.S. Cherry, and J.,Jr. Cairns. Cellulolytic Activity as a Novel Approach to Assess Long-Term Zinc Stress to Corbicula. Water Res.23(10): 1275-1283.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NOEC	Whole Organism	T	34	NR	NR	ug/L	LAB	1989. Farris, J.L., S.E. Belanger, D.S. Cherry, and J.,Jr. Cairns. Cellulolytic Activity as a Novel Approach to Assess Long-Term Zinc Stress to Corbicula. Water Res.23(10): 1275-1283.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NOEC	Whole Organism	T	34	NR	NR	ug/L	LAB	1989. Farris, J.L., S.E. Belanger, D.S. Cherry, and J.,Jr. Cairns. Cellulolytic Activity as a Novel Approach to Assess Long-Term Zinc Stress to Corbicula. Water Res.23(10): 1275-1283.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NR	Not Reported	T	43	NA	NR	ug/L	FIELDA	1986. Belanger, S.E., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. Growth of Asiatic Clams (Corbicula sp.) During and After Long-Term Zinc Exposure in Field-Located and Laboratory Artificial Streams. Arch. Environ. Contam. Toxicol.15(4): 427-434.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NR	Not Reported	T	43	NA	NR	ug/L	FIELDA	1986. Belanger, S.E., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. Growth of Asiatic Clams (Corbicula sp.) During and After Long-Term Zinc Exposure in Field-Located and Laboratory Artificial Streams. Arch. Environ. Contam. Toxicol.15(4): 427-434.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NR	Not Reported	T	87	NA	NR	ug/L	FIELDA	1986. Belanger, S.E., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. Growth of Asiatic Clams (Corbicula sp.) During and After Long-Term Zinc Exposure in Field-Located and Laboratory Artificial Streams. Arch. Environ. Contam. Toxicol.15(4): 427-434.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NR	Not Reported	T	121.2	NA	NR	ug/L	FIELDA	1986. Belanger, S.E., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. Growth of Asiatic Clams (Corbicula sp.) During and After Long-Term Zinc Exposure in Field-Located and Laboratory Artificial Streams. Arch. Environ. Contam. Toxicol.15(4): 427-434.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NR	Not Reported	T	35	NA	NR	ug/L	FIELDA	1986. Belanger, S.E., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. Growth of Asiatic Clams (Corbicula sp.) During and After Long-Term Zinc Exposure in Field-Located and Laboratory Artificial Streams. Arch. Environ. Contam. Toxicol.15(4): 427-434.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NR	Not Reported	T	20	NA	NR	ug/L	FIELDA	1986. Belanger, S.E., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. Growth of Asiatic Clams (Corbicula sp.) During and After Long-Term Zinc Exposure in Field-Located and Laboratory Artificial Streams. Arch. Environ. Contam. Toxicol.15(4): 427-434.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NR	Shell	T	121.2	NA	NR	ug/L	FIELDA	1986. Belanger, S.E., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. Growth of Asiatic Clams (Corbicula sp.) During and After Long-Term Zinc Exposure in Field-Located and Laboratory Artificial Streams. Arch. Environ. Contam. Toxicol.15(4): 427-434.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NR	Shell	T	43	NA	NR	ug/L	FIELDA	1986. Belanger, S.E., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. Growth of Asiatic Clams (Corbicula sp.) During and After Long-Term Zinc Exposure in Field-Located and Laboratory Artificial Streams. Arch. Environ. Contam. Toxicol.15(4): 427-434.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NR	Shell	T	43	NA	NR	ug/L	FIELDA	1986. Belanger, S.E., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. Growth of Asiatic Clams (Corbicula sp.) During and After Long-Term Zinc Exposure in Field-Located and Laboratory Artificial Streams. Arch. Environ. Contam. Toxicol.15(4): 427-434.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Growth	NR	Shell	T	35	NA	NR	ug/L	FIELDA	1986. Belanger, S.E., J.L. Farris, D.S. Cherry, and J.,Jr. Cairns. Growth of Asiatic Clams (Corbicula sp.) During and After Long-Term Zinc Exposure in Field-Located and Laboratory Artificial Streams. Arch. Environ. Contam. Toxicol.15(4): 427-434.
Zinc	Clam	Molluscs	NR	Mortality	LC5	Not Reported	T	3520	NA	NR	ug/L	LAB	1983. Kulkarni, K.M.. Accumulation of Copper, Zinc and Cadmium in the Clam Puphia textile. Environ. Ecol.1(3): 197-199.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	8800	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	NR	Mortality	LC50	Not Reported	T	1620	NA	NR	ug/L	LAB	1979. Sommani, P.. Toxicity of Heavy Metals to Clam (Donax faba Chemnitz). Thai Fish. Gaz.32(4): 391-399.
Zinc	Clam	Molluscs	NR	Mortality	LC95	Not Reported	T	11200	NA	NR	ug/L	LAB	1983. Kulkarni, K.M.. Accumulation of Copper, Zinc and Cadmium in the Clam Puphia textile. Environ. Ecol.1(3): 197-199.
Sulfuric acid, Zinc salt (1:1)	Clam	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Farris, J.L., S.E. Belanger, D.S. Cherry, and J.,Jr. Cairns. Cellulolytic Activity as a Novel Approach to Assess Long-Term Zinc Stress to Corbicula. Water Res.23(10): 1275-1283.
Sulfuric acid, Zinc salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	240		NC	ug/L	LAB	2004. Wong, C.K., and A.P. Pak. Acute and Subchronic Toxicity of the Heavy Metals Copper, Chromium, Nickel, and Zinc, Individually and in Mixture, to the Freshwater Copepod Mesocyclops pehpeiensis. Bull. Environ. Contam. Toxicol.73(1): 190-196.
Sulfuric acid, Zinc salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	1400	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Copepod	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	80	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Zinc chloride (ZnCl2)	Copepod	Crustaceans	Fresh	Mortality	NR	Not Reported	T	0.00001	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Sulfuric acid, Zinc salt (1:1)	Crab	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	15700		NC	ug/L	LAB	1999. Bianchini, A., and P. Carvalho de Castilho. Effects of Zinc Exposure on Oxygen Consumption and Gill Na+, K+-ATPase of the Estuarine Crab Chasmagnathus granulata Dana, 1851 (Decapoda - Grapsidae). Bull. Environ. Contam. Toxicol.62(1): 63-69.
Sulfuric acid, Zinc salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	80000		NC	ug/L	LAB	2006. Khan, M.A.Q., S.A. Ahmed, B. Catalin, A. Khodadoust, O. Ajayi, and M. Vaughn. Effect of Temperature on Heavy Metal Toxicity to Juvenile Crayfish, Orconectes immunis (Hagen). Environ. Toxicol.21(5): 513-520.
Sulfuric acid, Zinc salt (1:1)	Crayfish	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	84000	NA	NR	ug/L	LAB	1986. Mirenda, R.J.. Acute Toxicity and Accumulation of Zinc in the Crayfish, Orconectes virilis (Hagen). Bull. Environ. Contam. Toxicol.37(3): 387-394.
Zinc chloride (ZnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	22000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Zinc chloride (ZnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	48000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Zinc chloride (ZnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	52000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Zinc chloride (ZnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	27000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Zinc chloride (ZnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	44000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Zinc chloride (ZnCl2)	Crayfish	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	58000	NA	NR	ug/L	LAB	1973. Boutet, C., and C. Chaisemartin. Specific Toxic Properties of Metallic Salts in Austro-potamobius pallipes pallipes and Orconectes limosus (Proprietes Toxiques Specifiques des sels Metalliques chez Austropotamobius pallipes pallipes et Orconectes limosu. C. R. Seances Soc. Biol. Fil.167(12): 1933-1938.
Zinc	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3310	NA	NR	ug/L	LAB	1988. Abbasi, S.A., P.C. Nipaney, and R. Soni. Studies on Environmental Management of Mercury (II), Chromium (VI) and Zinc (II) with Respect to the Impact on Some Arthropods and Protozoans - Toxicity of Zinc (II). Int. J. Environ. Stud.32: 181-187.
Sulfuric acid, Zinc salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1486	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Sulfuric acid, Zinc salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2600*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Zinc salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	690*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Zinc salt (1:1)	Cyclopoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	820*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Daggerblade Grass Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	260		NC	ug/L	LAB	1979. McKenney, C.L.,Jr.. Ecophysiological Studies on the Ontogeny of Euryplasticity in the Caridean Shrimp, Palaemonetes pugio (Hothuis) and Modifications by Zinc. Ph.D.Thesis, Texas A&M, Univ., College Station, TX: 217 p..
Zinc chloride (ZnCl2)	Daggerblade Grass Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. McKenney, C.L.J., and J.M. Neff. Individual Effects and Interactions of Salinity, Temperature, and Zinc on Larval Development of the Grass Shrimp Palaemonetes pugio. I. Survival and Developmental Duration Through Metamorphosis. Mar. Biol.52(2): 177-188.
Zinc chloride (ZnCl2)	Daggerblade Grass Shrimp	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1979. McKenney, C.L.,Jr.. Ecophysiological Studies on the Ontogeny of Euryplasticity in the Caridean Shrimp, Palaemonetes pugio (Hothuis) and Modifications by Zinc. Ph.D.Thesis, Texas A&M, Univ., College Station, TX: 217 p..
Zinc chloride (ZnCl2)	Daggerblade Grass Shrimp	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	260		NC	ug/L	LAB	1979. McKenney, C.L.,Jr.. Ecophysiological Studies on the Ontogeny of Euryplasticity in the Caridean Shrimp, Palaemonetes pugio (Hothuis) and Modifications by Zinc. Ph.D.Thesis, Texas A&M, Univ., College Station, TX: 217 p..
Zinc chloride (ZnCl2)	Daggerblade Grass Shrimp	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1979. McKenney, C.L.,Jr.. Ecophysiological Studies on the Ontogeny of Euryplasticity in the Caridean Shrimp, Palaemonetes pugio (Hothuis) and Modifications by Zinc. Ph.D.Thesis, Texas A&M, Univ., College Station, TX: 217 p..
Zinc chloride (ZnCl2)	Daggerblade Grass Shrimp	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1979. McKenney, C.L.,Jr.. Ecophysiological Studies on the Ontogeny of Euryplasticity in the Caridean Shrimp, Palaemonetes pugio (Hothuis) and Modifications by Zinc. Ph.D.Thesis, Texas A&M, Univ., College Station, TX: 217 p..
Sulfuric acid, Zinc salt (1:1)	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	180000	NR	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Sulfuric acid, Zinc salt (1:1)	Damselfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	100000	NR	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Zinc	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	32000	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Zinc	Damselfly Order	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	26200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Zinc	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	28000000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Zinc	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	30100000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Zinc	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	46200000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Zinc	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	16700000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Zinc	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	17700000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Zinc	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	39700000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Zinc	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	16600000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Zinc	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	17300000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Zinc	Earthworm	Worms	NR	Mortality	LD50	Not Reported	T	39700000	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Zinc	Earthworm	Worms	NR	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Guerin, C., N. Giani, and M. Sire. A Study of the Sensitivity of Enchytraeus variatus (Oligochaeta, Enchytraeidae) to Certain Salts of Heavy Metals in Relation to Its Use as a Test Organism. Ann. Limnol.30(3): 167-178.
Sulfuric acid, Zinc salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC20	Not Reported	T	170	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Sulfuric acid, Zinc salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1993. Centeno, M.D., L. Brendonck, and G. Persoone. Cyst-Based Toxicity Tests. III. Development and Standardization of an Acute Toxicity Test with the Freshwater Anostracan Crustacean Streptocephalus proboscideus. In: A.M.V.M.Soares and P.Calow (Eds.), Progress in Standardization of Aquatic Toxicity Tests, Lewis Publishers: 37-55.
Sulfuric acid, Zinc salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	580	NA	NR	ug/L	LAB	1994. Crisinel, A., L. Delaunay, D. Rossel, J. Tarradellas, H. Meyer, H. Saiah, P. Vogel, C. Delisle, and C. Blaise. Cyst-Based Ecotoxicological Tests Using Anostracans: Comparison of
Sulfuric acid, Zinc salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1994. Crisinel, A., L. Delaunay, D. Rossel, J. Tarradellas, H. Meyer, H. Saiah, P. Vogel, C. Delisle, and C. Blaise. Cyst-Based Ecotoxicological Tests Using Anostracans: Comparison of
Sulfuric acid, Zinc salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	220	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Sulfuric acid, Zinc salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1995. Centeno, M.D.F., G. Persoone, and M.P. Goyvaerts. Cyst-Based Toxicity Tests. IX. The Potential of Thamnocephalus platyurus as Test Species in Comparison with Streptocephalus proboscideus (Crustacea: Branchiopoda: Anostraca). Environ. Toxicol. Water Qual.10(4): 275-282.
Sulfuric acid, Zinc salt (1:1)	Fairy Shrimp	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	60	NR	NR	ug/L	LAB	2008. Heinlaan, M., A. Ivask, I. Blinova, H.C. Dubourguier, and A. Kahru. Toxicity of Nanosized and Bulk ZnO, CuO and TiO2 to Bacteria Vibrio fischeri and Crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere71(7): 1308-1316.
Zinc chloride (ZnCl2)	Fairy Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1991. Mizutani, A., E. Ifune, A. Zanella, and C. Eriksen. Uptake of Lead, Cadmium and Zinc by the Fairy Shrimp, Branchinecta longiantenna (Crustacea; Anostraca). Hydrobiologia212: 145-149.
Zinc chloride (ZnCl2)	Fairy Shrimp	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1991. Mizutani, A., E. Ifune, A. Zanella, and C. Eriksen. Uptake of Lead, Cadmium and Zinc by the Fairy Shrimp, Branchinecta longiantenna (Crustacea; Anostraca). Hydrobiologia212: 145-149.
Sulfuric acid, Zinc salt (1:1)	Flathead Mayfly	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Hatakeyama, S.. Effect of Copper and Zinc on the Growth and Emergence of Epeorus latifolium (Ephemeroptera) in an Indoor Model Stream. Hydrobiologia174(1): 17-27.
Sulfuric acid, Zinc salt (1:1)	Flathead Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Hatakeyama, S.. Effect of Copper and Zinc on the Growth and Emergence of Epeorus latifolium (Ephemeroptera) in an Indoor Model Stream. Hydrobiologia174(1): 17-27.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100		NC	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130		NC	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1780		NC	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	22390		NC	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1500	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	350	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50000	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5010	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	210	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33200	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3550	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Sulfuric acid, Zinc salt (1:1)	Fleshy Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	1993. Zang, W., X. Xu, X. Dai, Z. Zhu, G. Xu, and R. Xu. Toxic Effects of Zn2+, Cu2+, Cd2+ and NH3 on Chinese Prawn. Chin. J. Oceanol. Limnol.11(3): 254-259.
Zinc	Fluke Class	Worms	NR	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1987. Zhokhov, A.E.. Effect of the Pollution of Water-Bodies on Life Cycles in Trematodes. C. A. Sel. -Environ. Pollut.17: 1 p..
Zinc chloride (ZnCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	408690		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Zinc chloride (ZnCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	207370		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Zinc chloride (ZnCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	109390		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Zinc chloride (ZnCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC10	Not Reported	T	56950		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	685010		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Zinc chloride (ZnCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	293780		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Zinc chloride (ZnCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	188960		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Zinc chloride (ZnCl2)	Freshwater Bivalve	Molluscs	Fresh	Mortality	LC50	Not Reported	T	134140		NC	ug/L	LAB	2004. Fugare, S.H., M.P. Deshmukh, B.B. Waykar, and B.K. Pardeshi. Acute Toxicity of Chlorides of Zinc, Copper and Mercury to Fresh Water Bivalve, Parreysia cylindrica (Annandale and Prashad). Nat. Environ. Pollut. Technol.3(2): 147-150.
Sulfuric acid, Zinc salt (1:1)	Freshwater Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7810		NC	ug/L	LAB	2007. Pestana, J.L.T., A. Re, A.J.A. Nogueira, and A.M.V.M. Soares. Effects of Cadmium and Zinc on the Feeding Behaviour of Two Freshwater Crustaceans: Atyaephyra desmarestii (Decapoda) and Echinogammarus meridionalis (Amphipoda). Chemosphere68(8): 1556-1562.
Sulfuric acid, Zinc salt (1:1)	Freshwater Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	722	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Sulfuric acid, Zinc salt (1:1)	Freshwater Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	879	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Zinc	Freshwater Sponge	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	0.0005	NR	NR	M	LAB	1995. Richelle, E., Y. Degoudenne, L. Dejonghe, and G. Van de Vyver. Experimental and Field Studies on the Effect of Selected Heavy Metals on Three Freshwater Sponge Species: Ephydatia fluviatilis, Ephydatia muelleri and Spongilla lacustris. Arch. Hydrobiol.135(2): 209-231.
Zinc chloride (ZnCl2)	Fresh-Water Sponge	Invertebrates	Fresh	Growth	NR		T	'1E-7	NA	NR	M	LAB	1988. Francis, J.C., and F.W. Harrison. Copper and Zinc Toxicity in Ephydatia fluviatilis (Porifera: Spongillidae). Trans. Am. Microsc. Soc.107(1): 67-78.
Zinc	Fresh-Water Sponge	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	0.0005	NR	NR	M	LAB	1995. Richelle, E., Y. Degoudenne, L. Dejonghe, and G. Van de Vyver. Experimental and Field Studies on the Effect of Selected Heavy Metals on Three Freshwater Sponge Species: Ephydatia fluviatilis, Ephydatia muelleri and Spongilla lacustris. Arch. Hydrobiol.135(2): 209-231.
Zinc chloride (ZnCl2)	Great Pond Snail	Molluscs	Fresh	Growth	NR	Whole Organism	T	100000		NC	ug/L	LAB	2006. Vyskushenko, A.D.. Effects of Copper Sulfate and Zinc Chloride on Lymnaea stagnalis L.. Hydrobiol. J.42(1): 107-113.
Zinc chloride (ZnCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC0	Not Reported	T	480		NC	ug/L	LAB	2006. Vyskushenko, A.D.. Effects of Copper Sulfate and Zinc Chloride on Lymnaea stagnalis L.. Hydrobiol. J.42(1): 107-113.
Zinc chloride (ZnCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC100	Not Reported	T	47800		NC	ug/L	LAB	2006. Vyskushenko, A.D.. Effects of Copper Sulfate and Zinc Chloride on Lymnaea stagnalis L.. Hydrobiol. J.42(1): 107-113.
Zinc chloride (ZnCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	9560		NC	ug/L	LAB	2006. Vyskushenko, A.D.. Effects of Copper Sulfate and Zinc Chloride on Lymnaea stagnalis L.. Hydrobiol. J.42(1): 107-113.
Zinc chloride (ZnCl2)	Great Pond Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	2006. Vyskushenko, A.D.. Effects of Copper Sulfate and Zinc Chloride on Lymnaea stagnalis L.. Hydrobiol. J.42(1): 107-113.
Sulfuric acid, Zinc salt (1:1)	Groundwater Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4500	NA	NR	ug/L	LAB	1992. Notenboom, J., K. Cruys, J. Hoekstra, and P. Van Beelen. Effect of Ambient Oxygen Concentration upon the Acute Toxicity of Chlorophenols and Heavy Metals to the Groundwater Copepod Parastenocaris germanica (Crustacea). Ecotoxicol. Environ. Saf.24(2): 131-143.
Sulfuric acid, Zinc salt (1:1)	Groundwater Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5400	NA	NR	ug/L	LAB	1992. Notenboom, J., K. Cruys, J. Hoekstra, and P. Van Beelen. Effect of Ambient Oxygen Concentration upon the Acute Toxicity of Chlorophenols and Heavy Metals to the Groundwater Copepod Parastenocaris germanica (Crustacea). Ecotoxicol. Environ. Saf.24(2): 131-143.
Sulfuric acid, Zinc salt (1:1)	Groundwater Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1992. Notenboom, J., K. Cruys, J. Hoekstra, and P. Van Beelen. Effect of Ambient Oxygen Concentration upon the Acute Toxicity of Chlorophenols and Heavy Metals to the Groundwater Copepod Parastenocaris germanica (Crustacea). Ecotoxicol. Environ. Saf.24(2): 131-143.
Sulfuric acid, Zinc salt (1:1)	Groundwater Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1992. Notenboom, J., K. Cruys, J. Hoekstra, and P. Van Beelen. Effect of Ambient Oxygen Concentration upon the Acute Toxicity of Chlorophenols and Heavy Metals to the Groundwater Copepod Parastenocaris germanica (Crustacea). Ecotoxicol. Environ. Saf.24(2): 131-143.
Sulfuric acid, Zinc salt (1:1)	Groundwater Copepod	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	32000	NA	NR	ug/L	LAB	1992. Notenboom, J., K. Cruys, J. Hoekstra, and P. Van Beelen. Effect of Ambient Oxygen Concentration upon the Acute Toxicity of Chlorophenols and Heavy Metals to the Groundwater Copepod Parastenocaris germanica (Crustacea). Ecotoxicol. Environ. Saf.24(2): 131-143.
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	3214		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	3028		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	2461		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC16	Not Reported	T	2005		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4409		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3967		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3259		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3025		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	6047		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	5196		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	4562		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Sulfuric acid, Zinc salt (1:1)	Hairy River Prawn	Crustaceans	Fresh	Mortality	LC84	Not Reported	T	4317		NC	ug/L	LAB	1992. Vijayaraman, K., and P. Geraldine. Toxicity Cadmium, Copper, Chromium and Zinc to Macrobrachium rude. Geobios19(2-3): 77-80.
Zinc chloride (ZnCl2)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	850		NC	ug/L	LAB	1982. Bengtsson, B.E., and B. Bergstrom. Toxicity Tests with Nitocra spinipes (Crustacea) and Some Metals Released from a Smelter Industry. In: K.Muller (Ed.), Coastal Research in the Gulf of Bothnia, Chapter 33, Dr.W.Junk Publ., The Hague, Netherlands:439-444 / Chem.Abstr.97: 439-444.
Zinc chloride (ZnCl2)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	850	NA	NR	ug/L	LAB	1987. Bengtsson, B.E., and B. Bergstrom. A Flowthrough Fecundity Test with Nitocra spinipes (Harpacticoidea Crustacea) for Aquatic Toxicity. Ecotoxicol. Environ. Saf.14: 260-268.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1380	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2890	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	940	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2070	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3230	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	620	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	920	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	480	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	480	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Zinc	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1250	NA	NR	ug/L	LAB	1985. Rao, S.V.R.. A Note on the Feasibility of Degradation of Phenol by Some Crustacean Larvae. Int. J. Environ. Stud.24(3-4): 273-275.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	780	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Harpacticoid Copepod	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Bengtsson, B.E., and B. Bergstrom. Toxicity Tests with Nitocra spinipes (Crustacea) and Some Metals Released from a Smelter Industry. In: K.Muller (Ed.), Coastal Research in the Gulf of Bothnia, Chapter 33, Dr.W.Junk Publ., The Hague, Netherlands:439-444 / Chem.Abstr.97: 439-444.
Zinc chloride (ZnCl2)	Harpacticoid Copepod	Crustaceans	Fresh	Reproduction	EC50		T	430	NA	NR	ug/L	LAB	1987. Bengtsson, B.E., and B. Bergstrom. A Flowthrough Fecundity Test with Nitocra spinipes (Harpacticoidea Crustacea) for Aquatic Toxicity. Ecotoxicol. Environ. Saf.14: 260-268.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	480	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	300	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Sulfuric acid, Zinc salt (1:1)	Harpacticoid Copepod	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	480	NR	NR	ug/L	LAB	2005. Brown, R.J., S.D. Rundle, T.H. Hutchinson, T.D. Williams, and M.B. Jones. A Microplate Freshwater Copepod Bioassay for Evaluating Acute and Chronic Effects of Chemicals. Environ. Toxicol. Chem.24(6): 1528-1531.
Zinc	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	14000		NC	ug/L	LAB	2002. Karntanut, W., and D. Pascoe. The Toxicity of Copper, Cadmium and Zinc to Four Different Hydra (Cnidaria: Hydrozoa). Chemosphere47(10): 1059-1064.
Zinc	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	11000		NC	ug/L	LAB	2002. Karntanut, W., and D. Pascoe. The Toxicity of Copper, Cadmium and Zinc to Four Different Hydra (Cnidaria: Hydrozoa). Chemosphere47(10): 1059-1064.
Zinc	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	13000		NC	ug/L	LAB	2002. Karntanut, W., and D. Pascoe. The Toxicity of Copper, Cadmium and Zinc to Four Different Hydra (Cnidaria: Hydrozoa). Chemosphere47(10): 1059-1064.
Zinc	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	14000		NC	ug/L	LAB	2002. Karntanut, W., and D. Pascoe. The Toxicity of Copper, Cadmium and Zinc to Four Different Hydra (Cnidaria: Hydrozoa). Chemosphere47(10): 1059-1064.
Zinc chloride (ZnCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Whole Organism	T	935		NC	ug/L	LAB	2001. Holdway, D.A., K. Lok, and M. Semaan. The Acute and Chronic Toxicity of Cadmium and Zinc to Two Hydra Species. Environ. Toxicol.16: 557-565.
Zinc chloride (ZnCl2)	Hydra	Invertebrates	Fresh	Mortality	LC50	Whole Organism	T	2300		NC	ug/L	LAB	2001. Holdway, D.A., K. Lok, and M. Semaan. The Acute and Chronic Toxicity of Cadmium and Zinc to Two Hydra Species. Environ. Toxicol.16: 557-565.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	33000		NC	ug/L	LAB	2005. Karntanut, W., and D. Pascoe. Effects of Removing Symbiotic Green Algae on the Response of Hydra viridissima (Pallas 1776) to Metals. Ecotoxicol. Environ. Saf.60(3): 301-305.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	54000		NC	ug/L	LAB	2005. Karntanut, W., and D. Pascoe. Effects of Removing Symbiotic Green Algae on the Response of Hydra viridissima (Pallas 1776) to Metals. Ecotoxicol. Environ. Saf.60(3): 301-305.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	12000		NC	ug/L	LAB	2005. Karntanut, W., and D. Pascoe. Effects of Removing Symbiotic Green Algae on the Response of Hydra viridissima (Pallas 1776) to Metals. Ecotoxicol. Environ. Saf.60(3): 301-305.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	7400		NC	ug/L	LAB	2005. Karntanut, W., and D. Pascoe. Effects of Removing Symbiotic Green Algae on the Response of Hydra viridissima (Pallas 1776) to Metals. Ecotoxicol. Environ. Saf.60(3): 301-305.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3800		NC	ug/L	LAB	2005. Karntanut, W., and D. Pascoe. Effects of Removing Symbiotic Green Algae on the Response of Hydra viridissima (Pallas 1776) to Metals. Ecotoxicol. Environ. Saf.60(3): 301-305.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	5200		NC	ug/L	LAB	2005. Karntanut, W., and D. Pascoe. Effects of Removing Symbiotic Green Algae on the Response of Hydra viridissima (Pallas 1776) to Metals. Ecotoxicol. Environ. Saf.60(3): 301-305.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2500		NC	ug/L	LAB	2005. Karntanut, W., and D. Pascoe. Effects of Removing Symbiotic Green Algae on the Response of Hydra viridissima (Pallas 1776) to Metals. Ecotoxicol. Environ. Saf.60(3): 301-305.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3500		NC	ug/L	LAB	2005. Karntanut, W., and D. Pascoe. Effects of Removing Symbiotic Green Algae on the Response of Hydra viridissima (Pallas 1776) to Metals. Ecotoxicol. Environ. Saf.60(3): 301-305.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	61520	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	21770	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	30000	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	26630	NA	NR	ug/L	LAB	1998. Beach, M.J., and D. Pascoe. The Role of Hydra vulgaris (Pallas) in Assessing the Toxicity of Freshwater Pollutants. Water Res.32(1): 101-106.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	11000	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	12880	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	6630	NA	NR	ug/L	LAB	1998. Beach, M.J., and D. Pascoe. The Role of Hydra vulgaris (Pallas) in Assessing the Toxicity of Freshwater Pollutants. Water Res.32(1): 101-106.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	7400	NR	NR	ug/L	LAB	2000. Karntanut, W., and D. Pascoe. A Comparison of Methods for Measuring Acute Toxicity to Hydra vulgaris. Chemosphere41: 1543-1548.
Zinc chloride (ZnCl2)	Hydra	Invertebrates	Fresh	Mortality	NR-LETH	Whole Organism	T	2000		NC	ug/L	LAB	2001. Holdway, D.A., K. Lok, and M. Semaan. The Acute and Chronic Toxicity of Cadmium and Zinc to Two Hydra Species. Environ. Toxicol.16: 557-565.
Zinc chloride (ZnCl2)	Hydra	Invertebrates	Fresh	Mortality	NR-LETH	Whole Organism	T	8000		NC	ug/L	LAB	2001. Holdway, D.A., K. Lok, and M. Semaan. The Acute and Chronic Toxicity of Cadmium and Zinc to Two Hydra Species. Environ. Toxicol.16: 557-565.
Sulfuric acid, Zinc salt (1:1)	Hydra	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	20000		NC	ug/L	LAB	2000. Ronco, A., C. Sobrero, V. Grassi, L. Kaminski, L. Massolo, and L. Mina. WaterTox Bioassay Intercalibration Network: Results from Argentina. Environ. Toxicol.15(4): 287-296.
Sulfuric acid, Zinc salt (1:1)	Isopod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20000	NR	NR	ug/L	LAB	1981. Bosnak, A.D., and E.L. Morgan. Acute Toxicity of Cadmium, Zinc, and Total Residual Chlorine to Epigean and Hypogean Isopods (Asellidae). Natl. Speleological Soc. Bull.43: 12-
Sulfuric acid, Zinc salt (1:1)	Isopod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	20220	NR	NR	ug/L	LAB	1981. Bosnak, A.D., and E.L. Morgan. Acute Toxicity of Cadmium, Zinc, and Total Residual Chlorine to Epigean and Hypogean Isopods (Asellidae). Natl. Speleological Soc. Bull.43: 12-
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	6400		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	640		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	6400		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	640		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	6400		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	640		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	6400		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	640		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	6400		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	640		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	6400		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	640		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	6400		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Growth	NOEL	Whole Organism	T	640		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	2050	NA	NR	ug/L	LAB	1989. Willis, M.. Experimental Studies on the Effects of Zinc on Erpobdella octulata (L.) (Annelida: Hirudinea) from the Afon Crafnant, N. Wales. Arch. Hydrobiol.116(4): 449-469.
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	8800	NA	NR	ug/L	LAB	1989. Willis, M.. Experimental Studies on the Effects of Zinc on Erpobdella octulata (L.) (Annelida: Hirudinea) from the Afon Crafnant, N. Wales. Arch. Hydrobiol.116(4): 449-469.
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	390000	NA	NR	ug/L	LAB	1989. Willis, M.. Experimental Studies on the Effects of Zinc on Erpobdella octulata (L.) (Annelida: Hirudinea) from the Afon Crafnant, N. Wales. Arch. Hydrobiol.116(4): 449-469.
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	4800000	NA	NR	ug/L	LAB	1989. Willis, M.. Experimental Studies on the Effects of Zinc on Erpobdella octulata (L.) (Annelida: Hirudinea) from the Afon Crafnant, N. Wales. Arch. Hydrobiol.116(4): 449-469.
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	1900000	NA	NR	ug/L	LAB	1989. Willis, M.. Experimental Studies on the Effects of Zinc on Erpobdella octulata (L.) (Annelida: Hirudinea) from the Afon Crafnant, N. Wales. Arch. Hydrobiol.116(4): 449-469.
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	340000	NA	NR	ug/L	LAB	1989. Willis, M.. Experimental Studies on the Effects of Zinc on Erpobdella octulata (L.) (Annelida: Hirudinea) from the Afon Crafnant, N. Wales. Arch. Hydrobiol.116(4): 449-469.
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	222000	NA	NR	ug/L	LAB	1989. Willis, M.. Experimental Studies on the Effects of Zinc on Erpobdella octulata (L.) (Annelida: Hirudinea) from the Afon Crafnant, N. Wales. Arch. Hydrobiol.116(4): 449-469.
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	600000	NA	NR	ug/L	LAB	1989. Willis, M.. Experimental Studies on the Effects of Zinc on Erpobdella octulata (L.) (Annelida: Hirudinea) from the Afon Crafnant, N. Wales. Arch. Hydrobiol.116(4): 449-469.
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	100000	NA	NR	ug/L	LAB	1989. Willis, M.. Experimental Studies on the Effects of Zinc on Erpobdella octulata (L.) (Annelida: Hirudinea) from the Afon Crafnant, N. Wales. Arch. Hydrobiol.116(4): 449-469.
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	60000	NA	NR	ug/L	LAB	1989. Willis, M.. Experimental Studies on the Effects of Zinc on Erpobdella octulata (L.) (Annelida: Hirudinea) from the Afon Crafnant, N. Wales. Arch. Hydrobiol.116(4): 449-469.
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	36660		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	41710		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	53050		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	59650		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	3180		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	5850		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	8120		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Mortality	LC50	Not Reported	T	9480		NC	ug/L	LAB	1995. Gray, H.M.. The Ecotoxicology of Zinc on a Freshwater Leech, Nephelopsis obscura. M.S.Thesis, Univ.of Calgary, Canada: 118 p..
Sulfuric acid, Zinc salt (1:1)	Leech	Worms	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Willis, M.. Experimental Studies on the Effects of Zinc on Erpobdella octulata (L.) (Annelida: Hirudinea) from the Afon Crafnant, N. Wales. Arch. Hydrobiol.116(4): 449-469.
Zinc	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	6100	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc chloride (ZnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3400		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3700		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3700		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Little Gray Punkie	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Sulfuric acid, Zinc salt (1:1)	Liver Elimia, River Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	18000	NA	NR	ug/L	LAB	1976. Cairns, J.,Jr., D.I. Messenger, and W.F. Calhoun. Invertebrate Response to Thermal Shock Following Exposure to Acutely Sub-Lethal Concentrations of Chemicals. Arch. Hydrobiol.77(2): 164-175.
Sulfuric acid, Zinc salt (1:1)	Liver Elimia, River Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	13500	NA	NR	ug/L	LAB	1976. Cairns, J.,Jr., D.I. Messenger, and W.F. Calhoun. Invertebrate Response to Thermal Shock Following Exposure to Acutely Sub-Lethal Concentrations of Chemicals. Arch. Hydrobiol.77(2): 164-175.
Zinc chloride (ZnCl2)	Long-Horn Caddisfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1992. Timmermans, K.R., E. Spijkerman, M. Tonkes, and H. Govers. Cadmium and Zinc Uptake by Two Species of Aquatic Invertebrate Predators from Dietary and Aqueous Sources. Can. J. Fish. Aquat. Sci.49(4): 655-662.
Sulfuric acid, Zinc salt (1:1)	Marron	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	139000		NC	ug/L	LAB	2002. Lindhjem, P.A., and M.G. Bennet-Chambers. Bioaccumulation and Acute Toxicity of Zinc in Marron, Cherax tenuimanus (Smith) (Decapoda: Parastacidae). In: G.J.Whisson and B.Knott, Proc.13th Symp.of the Int.Assoc.of Astacology: 424-430.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	10270		NC	ug/L	LAB	2002. Everitt, V., P.A. Scherman, and M.H. Villet. The Toxicity of Zinc to a Selected Macroinvertebrate, Adenophlebia auriculata (Ephemeroptera, Leptophlebiidae): Method Development. Afr. J. Aquat. Sci.27(1): 31-38.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	50690		NC	ug/L	LAB	2002. Everitt, V., P.A. Scherman, and M.H. Villet. The Toxicity of Zinc to a Selected Macroinvertebrate, Adenophlebia auriculata (Ephemeroptera, Leptophlebiidae): Method Development. Afr. J. Aquat. Sci.27(1): 31-38.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	51540		NC	ug/L	LAB	2002. Everitt, V., P.A. Scherman, and M.H. Villet. The Toxicity of Zinc to a Selected Macroinvertebrate, Adenophlebia auriculata (Ephemeroptera, Leptophlebiidae): Method Development. Afr. J. Aquat. Sci.27(1): 31-38.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	52130		NC	ug/L	LAB	2002. Everitt, V., P.A. Scherman, and M.H. Villet. The Toxicity of Zinc to a Selected Macroinvertebrate, Adenophlebia auriculata (Ephemeroptera, Leptophlebiidae): Method Development. Afr. J. Aquat. Sci.27(1): 31-38.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	54240		NC	ug/L	LAB	2002. Everitt, V., P.A. Scherman, and M.H. Villet. The Toxicity of Zinc to a Selected Macroinvertebrate, Adenophlebia auriculata (Ephemeroptera, Leptophlebiidae): Method Development. Afr. J. Aquat. Sci.27(1): 31-38.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	5950		NC	ug/L	LAB	2002. Everitt, V., P.A. Scherman, and M.H. Villet. The Toxicity of Zinc to a Selected Macroinvertebrate, Adenophlebia auriculata (Ephemeroptera, Leptophlebiidae): Method Development. Afr. J. Aquat. Sci.27(1): 31-38.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	130500	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1330	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	50500		NC	ug/L	LAB	2008. Brinkman, S.F., and W.D. Johnston. Acute Toxicity of Aqueous Copper, Cadmium, and Zinc to the Mayfly Rhithrogena hageni. Arch. Environ. Contam. Toxicol.54(3): 466-472.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	130500	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	1330	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD0	Not Reported	T	50000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD0	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD100	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD100	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	130500	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LD50	Not Reported	T	1330	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	LOEL	Not Reported	T	10800		NC	ug/L	LAB	2008. Brinkman, S.F., and W.D. Johnston. Acute Toxicity of Aqueous Copper, Cadmium, and Zinc to the Mayfly Rhithrogena hageni. Arch. Environ. Contam. Toxicol.54(3): 466-472.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	NOEL	Not Reported	T	5300		NC	ug/L	LAB	2008. Brinkman, S.F., and W.D. Johnston. Acute Toxicity of Aqueous Copper, Cadmium, and Zinc to the Mayfly Rhithrogena hageni. Arch. Environ. Contam. Toxicol.54(3): 466-472.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Mayfly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Sulfuric acid, Zinc salt (1:1)	Mayfly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	D	9200	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Zinc	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	900	NA	NR	ug/L	LAB	1992. Timmermans, K.R., W. Peeters, and M. Tonkes. Cadmium, Zinc, Lead and Copper in Chironomus riparius (Meigen) Larvae (Diptera, Chironomidae): Uptake and Effects. Hydrobiologia241(2): 119-134.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	uM	LAB	1995. Postma, J.F., M. Kyed, and W. Admiraal. Site Specific Differentiation in Metal Tolerance in the Midge Chironomus riparius (Diptera, Chironomidae). Hydrobiologia315(2): 159-165.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	uM	LAB	1995. Postma, J.F., S. Mol, H. Larsen, and W. Admiraal. Life-Cycle Changes and Zinc Shortage in Cadmium-Tolerant Midges, Chironomus riparius (Diptera), Reared in the Absence of Cadmium. Environ. Toxicol. Chem.14(1): 117-122.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Sibley, P.K., G.T. Ankley, A.M. Cotter, and E.N. Leonard. Predicting Chronic Toxicity of Sediments Spiked with Zinc: An Evaluation of the Acid-Volatile Sulfide Model Using a Life-Cycle Test with the Midge. Environ. Toxicol. Chem.15(12): 2102-2112.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	10500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	13500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	20500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	22000	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	27500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. The Effect of Multi-Generational Exposure to Metals and Resultant Change in Median Lethal Toxicity Tests Values over Subsequent Generations. Bull. Environ. Contam. Toxicol.80(1): 63-67.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1125	NA	NR	ug/L	LAB	1995. Phipps, G.L., V.R. Mattson, and G.T. Ankley. Relative Sensitivity of Three Freshwater Benthic Macroinvertebrates to Ten Contaminants. Arch. Environ. Contam. Toxicol.28(3): 281-286.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	16200		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2800		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3600		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9600		NC	ug/L	LAB	2008. Vedamanikam, V.J., and N.A.M. Shazilli. Comparative Toxicity of Nine Metals to Two Malaysian Aquatic Dipterian Larvae with Reference to Temperature Variation. Bull. Environ. Contam. Toxicol.80(6): 516-520.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	12770	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	15820	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	26500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	26500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	26500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2800	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	33500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	33500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	3600	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	4500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	7500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9500	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	9940	NR	NR	ug/L	LAB	2009. Vedamanikam, V.J., and N.A.M. Shazili. The Chironomid Larval Tube, a Mechanism to Protect the Organism from Environmental Disturbances?. Toxicol. Environ. Chem.91(1): 171-176.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	94300	NA	NR	ug/L	LAB	1998. Ibrahim, H., R. Kheir, S. Helmi, J. Lewis, and M. Crane. Effects of Organophosphorus, Carbamate, Pyrethroid and Organochlorine Pesticides, and a Heavy Metal on Survival and Cholinesterase Activity of. Bull. Environ. Contam. Toxicol.60: 448-455.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	150000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	80000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1996. Sibley, P.K., G.T. Ankley, A.M. Cotter, and E.N. Leonard. Predicting Chronic Toxicity of Sediments Spiked with Zinc: An Evaluation of the Acid-Volatile Sulfide Model Using a Life-Cycle Test with the Midge. Environ. Toxicol. Chem.15(12): 2102-2112.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	36.8	NA	NR	ug/L	LAB	1980. Anderson, R.L., C.T. Walbridge, and J.T. Fiandt. Survival and Growth of Tanytarsus dissimilis (Chironomidae) Exposed to Copper, Cadmium, Zinc, and Lead. Arch. Environ. Contam. Toxicol.9(3): 329-335.
Sulfuric acid, Zinc salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	32600		NC	ug/L	LAB	2001. Fargasova, A.. Winter Third- to Fourth-Instar Larvae of Chironomus plumosus as Bioassay Tools for Assessment of Acute Toxicity of Metals and Their Binary Combinations. Ecotoxicol. Environ. Saf.48(1): 1-5.
Sulfuric acid, Zinc salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	151970	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Sulfuric acid, Zinc salt (1:1)	Midge	Insects/Spiders	NR	Mortality	LC50	Not Reported	T	25316*	NA	NR	ug/L	LAB	1981. Rao, D.S., and A.B. Saxena. Acute Toxicity of Mercury, Zinc, Lead, Cadmium, Manganese to the Chironomus sp. Int. J. Environ. Stud.16(3-4): 225-226.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	21500	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	LC50*	Not Reported	T	18200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid, Zinc salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	LC95	Not Reported	T	203500		NC	ug/L	LAB	2001. Fargasova, A.. Winter Third- to Fourth-Instar Larvae of Chironomus plumosus as Bioassay Tools for Assessment of Acute Toxicity of Metals and Their Binary Combinations. Ecotoxicol. Environ. Saf.48(1): 1-5.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Timmermans, K.R., and P.A. Walker. The Fate of Trace Metals During the Metamorphosis of Chironomids (Diptera, Chironomidae). Environ. Pollut.62(1): 73-85.
Zinc	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Timmermans, K.R., and P.A. Walker. The Fate of Trace Metals During the Metamorphosis of Chironomids (Diptera, Chironomidae). Environ. Pollut.62(1): 73-85.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	uM	LAB	1995. Postma, J.F., M. Kyed, and W. Admiraal. Site Specific Differentiation in Metal Tolerance in the Midge Chironomus riparius (Diptera, Chironomidae). Hydrobiologia315(2): 159-165.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	81.6	NA	NR	ug/L	LAB	1995. Postma, J.F., S. Mol, H. Larsen, and W. Admiraal. Life-Cycle Changes and Zinc Shortage in Cadmium-Tolerant Midges, Chironomus riparius (Diptera), Reared in the Absence of Cadmium. Environ. Toxicol. Chem.14(1): 117-122.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Sibley, P.K., G.T. Ankley, A.M. Cotter, and E.N. Leonard. Predicting Chronic Toxicity of Sediments Spiked with Zinc: An Evaluation of the Acid-Volatile Sulfide Model Using a Life-Cycle Test with the Midge. Environ. Toxicol. Chem.15(12): 2102-2112.
Sulfuric acid, Zinc salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Sulfuric acid, Zinc salt (1:1)	Midge	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	930.6	NA	NR	ug/L	LAB	1995. Postma, J.F., S. Mol, H. Larsen, and W. Admiraal. Life-Cycle Changes and Zinc Shortage in Cadmium-Tolerant Midges, Chironomus riparius (Diptera), Reared in the Absence of Cadmium. Environ. Toxicol. Chem.14(1): 117-122.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Sibley, P.K., G.T. Ankley, A.M. Cotter, and E.N. Leonard. Predicting Chronic Toxicity of Sediments Spiked with Zinc: An Evaluation of the Acid-Volatile Sulfide Model Using a Life-Cycle Test with the Midge. Environ. Toxicol. Chem.15(12): 2102-2112.
Zinc chloride (ZnCl2)	Midge	Insects/Spiders	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Sibley, P.K., G.T. Ankley, A.M. Cotter, and E.N. Leonard. Predicting Chronic Toxicity of Sediments Spiked with Zinc: An Evaluation of the Acid-Volatile Sulfide Model Using a Life-Cycle Test with the Midge. Environ. Toxicol. Chem.15(12): 2102-2112.
Zinc	Mollusk Phylum	Molluscs	NR	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1987. Zhokhov, A.E.. Effect of the Pollution of Water-Bodies on Life Cycles in Trematodes. C. A. Sel. -Environ. Pollut.17: 1 p..
Sulfuric acid, Zinc salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	355	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Sulfuric acid, Zinc salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	588	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Sulfuric acid, Zinc salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	268	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Sulfuric acid, Zinc salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	438	NA	NR	ug/L	LAB	1991. Keller, A.E., and S.G. Zam. The Acute Toxicity of Selected Metals to the Freshwater Mussel, Anodonta imbecilis. Environ. Toxicol. Chem.10(4): 539-546.
Sulfuric acid, Zinc salt (1:1)	Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	66000	NA	NR	ug/L	LAB	1983. Millington, P.J., and K.F. Walker. Australian Freshwater Mussel Velesunio ambiguus (Philippi) as a Biological Monitor for Zinc, Iron and Manganese. Aust. J. Mar. Freshw. Res.34(6): 873-892.
Zinc chloride (ZnCl2)	Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1999. Kaspler, P.. Effect of Cadmium and Zinc Salts on Energy Metabolism and Survival of Unio tumidus Philipsson. J. Basic Clin. Physiol. Pharmacol.10(1): 57-72.
Sulfuric acid, Zinc salt (1:1)	Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1999. Kaspler, P.. Effect of Cadmium and Zinc Salts on Energy Metabolism and Survival of Unio tumidus Philipsson. J. Basic Clin. Physiol. Pharmacol.10(1): 57-72.
Sulfuric acid, Zinc salt (1:1)	Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	18000		NC	ug/L	LAB	2007. Loayza-Muro, R., and R. Elias-Letts. Responses of the Mussel Anodontites trapesialis (Unionidae) to Environmental Stressors: Effect of pH, Temperature and Metals on Filtration Rate. Environ. Pollut.149(2): 209-215.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2.16	L	0.925	mmol/L	LAB	1997. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Predicting Relative Metal Toxicity with Ion Characteristics: Caenorhabditis elegans LC50. Aquat. Toxicol.39(3-4): 279-290.
Zinc chloride (ZnCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	202000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Zinc chloride (ZnCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Zinc chloride (ZnCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Zinc chloride (ZnCl2)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Williams, P.L., and D.B. Dusenbery. Aquatic Toxicity Testing Using the Nematode, Caenorhabditis elegans. Environ. Toxicol. Chem.9(10): 1285-1290.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	67600		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	42700		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	32800		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	24300		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	19800		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	17300		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	451300		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	212500		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	135700		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	99300		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	83100		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Sulfuric acid, Zinc salt (1:1)	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	72900		NC	ug/L	LAB	2006. Sanchez-Moreno, S., J.A. Camargo, and A. Navas. Ecotoxicological Assessment of the Impact of Residual Heavy Metals on Soil Nematodes in the Guadiamar River Basin (Southern Spain). Environ. Monit. Assess.116(1-3): 245-262.
Zinc nitrate	Nematode	Worms	Fresh	Mortality	LC50	Not Reported	T	6.5	L	5.98	mM	LAB	1998. Tatara, C.P., M.C. Newman, J.T. McCloskey, and P.L. Williams. Use of Ion Characteristics to Predict Relative Toxicity of Mono-, Di- and Trivalent Metal Ions: Caenorhabditis elegans. Aquat. Toxicol.42: 255-269.
Zinc chloride (ZnCl2)	Nematode	Worms	Fresh	Mortality	NOEC	Not Reported	T	1000000	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Zinc chloride (ZnCl2)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Jaworska, M., A. Gorczyca, J. Sepiol, and P. Tomasik. Effect of Metal Ions on the Entomopathogenic Nematode Heterorhabditis bacteriophora Poinar (Nematode: Heterohabditidae) Under Laboratory Conditions. Water Air Soil Pollut.93: 157-166.
Zinc chloride (ZnCl2)	Nematode	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Jaworska, M., J. Sepiol, and P. Tomasik. Effect of Metal Ions Under Laboratory Conditions on the Entomopathogenic Steinernema carpocapsae (Rhabditida: Steinernematidae). Water Air Soil Pollut.88(3-4): 331-341.
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	14200	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	15600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	18300	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	19600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	13500	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	15000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	15600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	17600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	18100	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	150*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	160*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Zinc salt (1:1)	Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	190*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Zinc	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	21200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Zinc	Oligochaete	Worms	Fresh	Mortality	LC50*	Not Reported	T	18400	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid, Zinc salt (1:1)	Oligochaete Family	Worms	Fresh	Mortality	LC50*	Not Reported	T	46000	NA	NR	ug/L	LAB	1968. Whitley, L.S.. The Resistance of Tubificid Worms to Three Common Pollutants. Hydrobiologia32(1-2): 193-205.
Zinc	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	2984	NA	NR	ug/L	LAB	1995. Phipps, G.L., V.R. Mattson, and G.T. Ankley. Relative Sensitivity of Three Freshwater Benthic Macroinvertebrates to Ten Contaminants. Arch. Environ. Contam. Toxicol.28(3): 281-286.
Zinc chloride (ZnCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	8100	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
Zinc chloride (ZnCl2)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	6300	NR	NR	ug/L	LAB	1980. Bailey, H.C., and D.H.W. Liu. Lumbriculus variegatus, a Benthic Oligochaete, as a Bioassay Organism. In: J.C.Eaton, P.R.Parrish, and A.C.Hendricks (Eds.), Aquatic Toxicology and Hazard Assessment, 3rd Symposium, ASTM STP 707, Philadelphia, PA: 205-215.
Sulfuric acid, Zinc salt (1:1)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	13000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	5000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Oligochaete, Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Zinc	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47780	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Zinc	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50620	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Zinc	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	34990	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Zinc	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8352	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Zinc chloride (ZnCl2)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3700	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Zinc chloride (ZnCl2)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Sulfuric acid, Zinc salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2060		NC	ug/L	LAB	1995. Brooks, A., R.M. White, and D.C. Paton. Effects of Heavy Metals on the Survival of Diacypris compacta (Herbst) (Ostracoda) from the Coorong, South Australia. Int. J. Salt Lake Res.4(2): 133-163.
Sulfuric acid, Zinc salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	660		NC	ug/L	LAB	1995. Brooks, A., R.M. White, and D.C. Paton. Effects of Heavy Metals on the Survival of Diacypris compacta (Herbst) (Ostracoda) from the Coorong, South Australia. Int. J. Salt Lake Res.4(2): 133-163.
Sulfuric acid, Zinc salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5250	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3500	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	800	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Ostracod	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	45	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Zinc chloride (ZnCl2)	Oyster Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	368	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Zinc	Parasitic Monogenean	Worms	Fresh	Growth	LOEL	Whole Organism	T	15		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Zinc	Parasitic Monogenean	Worms	Fresh	Growth	LOEL	Whole Organism	T	15		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Zinc	Parasitic Monogenean	Worms	Fresh	Growth	LOEL	Whole Organism	T	15		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Zinc	Parasitic Monogenean	Worms	Fresh	Mortality	NOEL	Not Reported	T	120		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Zinc	Parasitic Monogenean	Worms	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Zinc	Parasitic Monogenean	Worms	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Zinc	Parasitic Monogenean	Worms	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Sulfuric acid, Zinc salt (1:1)	Parasitic Monogenean	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	488		NC	ug/L	LAB	2004. Poleo, A.B.S., J. Schjolden, H. Hansen, T.A. Bakke, T.A. Mo, B.O. Rosseland, and E. Lydersen. The Effect of Various Metals on Gyrodactylus salaris (Platyhelminthes, Monogenea) Infections in Atlantic Salmon (Salmo salar). Parasitology128(2): 169-177.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Parasitic Monogenean	Worms	Fresh	Reproduction	NOEL	Not Reported	T	120		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Zinc	Parasitic Monogenean	Worms	Fresh	Reproduction	NOEL	Not Reported	T	120		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Zinc	Parasitic Monogenean	Worms	Fresh	Reproduction	NOEL	Not Reported	T	120		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Zinc	Parasitic Monogenean	Worms	Fresh	Reproduction	NOEL	Not Reported	T	120		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Zinc	Parasitic Monogenean	Worms	Fresh	Reproduction	NR	Not Reported	T	NR		NC	ug/L	LAB	2007. Gheorghiu, C., J. Cable, D.J. Marcogliese, and M.E. Scott. Effects of Waterborne Zinc on Reproduction, Survival and Morphometrics of Gyrodactylus turnbulli (Monogenea) on Guppies (Poecilia reticulata). Int. J. Parasitol.37(3-4): 375-381.
Zinc chloride (ZnCl2)	Penaeidean Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Zinc chloride (ZnCl2)	Penaeidean Shrimp	Crustaceans	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Zinc chloride (ZnCl2)	Pewter Physa, Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Patrick, R., J.,Jr. Cairns, and A. Scheier. The Relative Sensitivity of Diatoms, Snails, and Fish to Twenty Common Constituents of Industrial Wastes. Prog. Fish-Cult.30(3): 137-
Zinc chloride (ZnCl2)	Pheasantshell, Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	356	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Zinc chloride (ZnCl2)	Pine Wilt Nematode	Worms	Fresh	Mortality	LD50	Not Reported	T	0.000018		NR	M	LAB	1984. Kobamoto, N., and Y. Izumi. The Nematicidal Effect of Metal Ions on the Pine Wood Nematode, Bursaphelenchus xylophilus. J. Pestic. Sci.9(3): 527-529.
Sulfuric acid, Zinc salt (1:1)	Pine Wilt Nematode	Worms	Fresh	Mortality	LD50	Not Reported	T	0.00001		NR	M	LAB	1984. Kobamoto, N., and Y. Izumi. The Nematicidal Effect of Metal Ions on the Pine Wood Nematode, Bursaphelenchus xylophilus. J. Pestic. Sci.9(3): 527-529.
Zinc chloride (ZnCl2)	Pine Wilt Nematode	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	0.001		NR	M	LAB	1984. Kobamoto, N., and Y. Izumi. The Nematicidal Effect of Metal Ions on the Pine Wood Nematode, Bursaphelenchus xylophilus. J. Pestic. Sci.9(3): 527-529.
Zinc chloride (ZnCl2)	Pink Shrimp, Common Prawn	Crustaceans	NR	Mortality	LC50	Not Reported	T	130000	NA	NR	ug/L	LAB	1973. Fraizier, A.. Study of Zinc Toxicity to the Rose Prawn Palaemon serratus Pennant (Etude de la Toxicite du Zinc Pour la Crevette Rose Palaemon serratus Pennant). Rev. Trav. Inst. Peches Marit.37(2): 291-302.
Zinc chloride (ZnCl2)	Pink Shrimp, Common Prawn	Crustaceans	NR	Mortality	LC50	Not Reported	T	80000	NA	NR	ug/L	LAB	1973. Fraizier, A.. Study of Zinc Toxicity to the Rose Prawn Palaemon serratus Pennant (Etude de la Toxicite du Zinc Pour la Crevette Rose Palaemon serratus Pennant). Rev. Trav. Inst. Peches Marit.37(2): 291-302.
Zinc chloride (ZnCl2)	Pink Shrimp, Common Prawn	Crustaceans	NR	Mortality	LC50	Not Reported	T	50000	NA	NR	ug/L	LAB	1973. Fraizier, A.. Study of Zinc Toxicity to the Rose Prawn Palaemon serratus Pennant (Etude de la Toxicite du Zinc Pour la Crevette Rose Palaemon serratus Pennant). Rev. Trav. Inst. Peches Marit.37(2): 291-302.
Sulfuric acid, Zinc salt (1:1)	Planarian	Worms	Fresh	Mortality	NR	Not Reported	T	30000	NA	NR	ug/L	LAB	1940. Jones, J.R.E.. A Further Study of the Relation Between Toxicity and Solution Pressure, with Polycelis nigra as Test Animal. J. Exp. Biol.17: 408-415.
Sulfuric acid, Zinc salt (1:1)	Polychaete Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1973. Bryan, G.W., and L.G. Hummerstone. Adaptation of the Polychaete Nereis diversicolor to Estuarine Sediments Containing high Concentrations of Zinc and Cadmium. J. Mar. Biol. Assoc. U. K.53(4): 839-857.
Sulfuric acid, Zinc salt (1:1)	Polychaete Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1973. Bryan, G.W., and L.G. Hummerstone. Adaptation of the Polychaete Nereis diversicolor to Estuarine Sediments Containing high Concentrations of Zinc and Cadmium. J. Mar. Biol. Assoc. U. K.53(4): 839-857.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	16130	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11740	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11150	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	10490	NA	NR	ug/L	LAB	1982. Khangarot, B.S., S. Mathur, and V.S. Durve. Comparative Toxicity of Heavy Metals and Interaction of Metals on a Freshwater Pulmonate Snail Lymnaea acuminata (Lamarck). Acta Hydrochim. Hydrobiol.10(4): 367-375.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4400	NA	NR	ug/L	LAB	1976. Cairns, J.,Jr., D.I. Messenger, and W.F. Calhoun. Invertebrate Response to Thermal Shock Following Exposure to Acutely Sub-Lethal Concentrations of Chemicals. Arch. Hydrobiol.77(2): 164-175.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4150	NA	NR	ug/L	LAB	1976. Cairns, J.,Jr., D.I. Messenger, and W.F. Calhoun. Invertebrate Response to Thermal Shock Following Exposure to Acutely Sub-Lethal Concentrations of Chemicals. Arch. Hydrobiol.77(2): 164-175.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	10230	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	16290	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	21810	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	9140	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8190	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11580	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	15400	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	6750	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7730	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11400	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	6650	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8010	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	51790	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1680	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1680	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Sensitivity of Freshwater Pulmonate Snails, Lymnaea luteola L., to Heavy Metals. Bull. Environ. Contam. Toxicol.41(2): 208-213.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8010	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Zinc Sensitivity of a Freshwater Snail, Lymnaea luteola L., in Relation to Seasonal Variations in Temperature. Bull. Environ. Contam. Toxicol.39(1): 45-49.
Sulfuric acid, Zinc salt (1:1)	Pond Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	6130	NA	NR	ug/L	LAB	1981. Mathur, S., B.S. Khangarot, and V.S. Durve. Acute Toxicity of Mercury, Copper and Zinc to a Freshwater Pulmonate Snail, Lymnaea luteola (Lamarck). Acta Hydrochim. Hydrobiol.9(4): 381-389.
Zinc chloride (ZnCl2)	Pond Snail, Pneumonate	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1958. Cairns, J.,Jr., and A. Scheier. The Effects of Temperature and Hardness of Water upon the Toxicity of Zinc to the Pond Snail (Physa heterostropha). Not. Nat. (Phila.)308: 11.
Zinc chloride (ZnCl2)	Pond Snail, Pneumonate	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1958. Cairns, J.,Jr., and A. Scheier. The Effects of Temperature and Hardness of Water upon the Toxicity of Zinc to the Pond Snail (Physa heterostropha). Not. Nat. (Phila.)308: 11.
Zinc chloride (ZnCl2)	Pond Snail, Pneumonate	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1958. Cairns, J.,Jr., and A. Scheier. The Effects of Temperature and Hardness of Water upon the Toxicity of Zinc to the Pond Snail (Physa heterostropha). Not. Nat. (Phila.)308: 11.
Zinc chloride (ZnCl2)	Pond Snail, Pneumonate	Molluscs	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1958. Cairns, J.,Jr., and A. Scheier. The Effects of Temperature and Hardness of Water upon the Toxicity of Zinc to the Pond Snail (Physa heterostropha). Not. Nat. (Phila.)308: 11.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1280	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1570	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2710	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3500	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4070	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	434	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	536	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	598	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	667	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	949	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1110	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1390	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1480	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2760	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3620	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	434	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	434	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	536	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	536	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	598	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1110	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1110	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1390	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1960	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	303	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3160	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	434	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	434	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	536	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1110	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1110	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1390	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	303	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3160	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	434	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	434	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	434	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Pond Snail, Pneumonate Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1110	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Zinc chloride (ZnCl2)	Pouch Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	771	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.
Zinc chloride (ZnCl2)	Pouch Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1274	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.
Sulfuric acid, Zinc salt (1:1)	Pouch Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5800	NA	NR	ug/L	LAB	1976. Cairns, J.,Jr., D.I. Messenger, and W.F. Calhoun. Invertebrate Response to Thermal Shock Following Exposure to Acutely Sub-Lethal Concentrations of Chemicals. Arch. Hydrobiol.77(2): 164-175.
Sulfuric acid, Zinc salt (1:1)	Pouch Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4400	NA	NR	ug/L	LAB	1976. Cairns, J.,Jr., D.I. Messenger, and W.F. Calhoun. Invertebrate Response to Thermal Shock Following Exposure to Acutely Sub-Lethal Concentrations of Chemicals. Arch. Hydrobiol.77(2): 164-175.
Zinc chloride (ZnCl2)	Pouch Snail	Molluscs	Fresh	Mortality	NOEC	Not Reported	T	570	NA	NR	ug/L	LAB	1986. Nebeker, A.V., A. Stinchfield, C. Savonen, and G.A. Chapman. Effects of Copper, Nickel and Zinc on Three Species of Oregon Freshwater Snails. Environ. Toxicol. Chem.5(9): 807-811.
Sulfuric acid, Zinc salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7810	NA	NR	ug/L	LAB	1986. Patil, H.S., and M.B. Kaliwal. Relative Sensitivity of a Freshwater Prawn Macrobrachium hendersodyanum to Heavy Metals. Environ. Ecol.4(2): 286-288.
Sulfuric acid, Zinc salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2979*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Toxicity of Copper Sulphate and Zinc Sulphate to Macrobrachium lamarrei (H. Milne Edwards) (Decapoda, Palaemonidae). Crustaceana (Leiden)47(2): 168-173.
Sulfuric acid, Zinc salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2461*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Toxicity of Copper Sulphate and Zinc Sulphate to Macrobrachium lamarrei (H. Milne Edwards) (Decapoda, Palaemonidae). Crustaceana (Leiden)47(2): 168-173.
Sulfuric acid, Zinc salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1733*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Toxicity of Copper Sulphate and Zinc Sulphate to Macrobrachium lamarrei (H. Milne Edwards) (Decapoda, Palaemonidae). Crustaceana (Leiden)47(2): 168-173.
Sulfuric acid, Zinc salt (1:1)	Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	733*	NA	NR	ug/L	LAB	1984. Murti, R., and G.S. Shukla. Toxicity of Copper Sulphate and Zinc Sulphate to Macrobrachium lamarrei (H. Milne Edwards) (Decapoda, Palaemonidae). Crustaceana (Leiden)47(2): 168-173.
Zinc chloride (ZnCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	50000	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Zinc chloride (ZnCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Zinc chloride (ZnCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	3100	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Zinc chloride (ZnCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	50000	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Zinc chloride (ZnCl2)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Sulfuric acid, Zinc salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	423	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Sulfuric acid, Zinc salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	414	NR	NR	ug/L	LAB	1998. Nalecz-Jawecki, G., and J. Sawicki. Toxicity of Inorganic Compounds in the Spirotox Test: A Miniaturized Version of the Spirostomum ambiguum Test. Arch. Environ. Contam. Toxicol.34(1): 1-5.
Sulfuric acid, Zinc salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Abraham, J.V., R.D. Butler, and D.C. Sigee. Quantified Elemental Changes in Aspidisca cicada and Vorticella convallaria After Exposure to Aluminium, Copper, and Zinc. Protoplasma198(3-4): 143-154.
Sulfuric acid, Zinc salt (1:1)	Protozoa	Invertebrates	Fresh	Mortality	NR-ZERO	Not Reported	T	500		NC	ug/L	LAB	1997. Abraham, J.V., R.D. Butler, and D.C. Sigee. Quantified Elemental Changes in Aspidisca cicada and Vorticella convallaria After Exposure to Aluminium, Copper, and Zinc. Protoplasma198(3-4): 143-154.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1050	NA	NR	ug/L	LAB	1992. Madoni, P., G. Esteban, and G. Gorbi. Acute Toxicity of Cadmium, Copper, Mercury, and Zinc to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.49(6): 900-905.
Zinc chloride (ZnCl2)	Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	254	NR	NR	ug/L	LAB	1994. Madoni, P., D. Davoli, and G. Gorbi. Acute Toxicity of Lead, Chromium, and Other Heavy Metals to Ciliates from Activated Sludge Plants. Bull. Environ. Contam. Toxicol.53(3): 420-425.
Zinc chloride (ZnCl2)	Protozoan Phylum	Invertebrates	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Madoni, P., D. Davoli, G. Gorbi, and L. Vescovi. Toxic Effect of Heavy Metals on the Activated Sludge Protozoan Community. Water Res.30(1): 135-141.
Zinc	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Zinc	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Zinc	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Zinc	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Zinc	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Zinc	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Zinc	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	umol/L	LAB	2003. Mouneyrac, C., O. Mastain, J.C. Amiard, C. Amiard-Triquet, P. Beaunier, A.Y. Jeantet, B.D. Smith, and P.S. Rainbow. Trace-Metal Detoxification and Tolerance of the Estuarine Worm Hediste diversicolor Chronically Exposed in Their Environment. Mar. Biol.143(4): 731-744.
Zinc chloride (ZnCl2)	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	T	25000	NR	NR	ug/L	LAB	2001. Bat, L., A. Guendogdu, M. Akbulut, M. Culha, and H.H. Satilmis. Toxicity of Zinc and Lead to the Polychaete (Hediste diversicolor Mueller 1776). Turk. J. Mar. Sci.7(2): 71-84.
Zinc chloride (ZnCl2)	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	T	35000	NR	NR	ug/L	LAB	2001. Bat, L., A. Guendogdu, M. Akbulut, M. Culha, and H.H. Satilmis. Toxicity of Zinc and Lead to the Polychaete (Hediste diversicolor Mueller 1776). Turk. J. Mar. Sci.7(2): 71-84.
Zinc chloride (ZnCl2)	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	T	18000	NR	NR	ug/L	LAB	2001. Bat, L., A. Guendogdu, M. Akbulut, M. Culha, and H.H. Satilmis. Toxicity of Zinc and Lead to the Polychaete (Hediste diversicolor Mueller 1776). Turk. J. Mar. Sci.7(2): 71-84.
Zinc chloride (ZnCl2)	Ragworm	Worms	Fresh	Mortality	LC50	Not Reported	T	9000	NR	NR	ug/L	LAB	2001. Bat, L., A. Guendogdu, M. Akbulut, M. Culha, and H.H. Satilmis. Toxicity of Zinc and Lead to the Polychaete (Hediste diversicolor Mueller 1776). Turk. J. Mar. Sci.7(2): 71-84.
Sulfuric acid, Zinc salt (1:1)	Ramshorn Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	61480*	NA	NR	ug/L	LAB	1979. Furmanska, M.. Studies of the Effect of Copper, Zinc, and Iron on the Biotic Components of Aquatic Ecosystems. Pol. Arch. Hydrobiol.26(1-2): 213-220.
Zinc chloride (ZnCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	3000		NC	ug/L	LAB	2005. Martin-Diaz, M.L., S.R. Tuberty, C.L.,Jr. McKenney, D. Sales, and T.A. Del Valls. Effects of Cadmium and Zinc on Procambarus clarkii: Simulation of the Aznalcollar Mining Spill. Cienc. Mar.31(1B): 197-202.
Zinc chloride (ZnCl2)	Red Swamp Crayfish	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1000		NC	ug/L	LAB	2005. Martin-Diaz, M.L., S.R. Tuberty, C.L.,Jr. McKenney, D. Sales, and T.A. Del Valls. Effects of Cadmium and Zinc on Procambarus clarkii: Simulation of the Aznalcollar Mining Spill. Cienc. Mar.31(1B): 197-202.
Sulfuric acid, Zinc salt (1:1)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1230		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Sulfuric acid, Zinc salt (1:1)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1054		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Sulfuric acid, Zinc salt (1:1)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	630		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Sulfuric acid, Zinc salt (1:1)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	395		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Sulfuric acid, Zinc salt (1:1)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	216		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Sulfuric acid, Zinc salt (1:1)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	318		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Sulfuric acid, Zinc salt (1:1)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	279		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	178		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Sulfuric acid, Zinc salt (1:1)	Riceland Prawn	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	127		NC	ug/L	LAB	2004. Othman, M.S., and M.N. Azwa. Acute Toxicity and Bioaccumulation of Zinc and Lead in the Freshwater Prawn Macrobrachium lanchesteri. Malays. J. Sci.23(2): 11-18.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Growth	NR		T	311.3	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1220	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	540	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4500	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1340	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	860	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	NR	Not Reported	T	311.3	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	105.4	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Reproduction	NR		T	320	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Reproduction	NR		T	105.4	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Sulfuric acid, Zinc salt (1:1)	River Limpet	Molluscs	Fresh	Reproduction	NR		T	186.7	NA	NR	ug/L	LAB	1988. Willis, M.. Experimental Studies of the Effects of Zinc on Ancylus fluviatilis (Mueller) (Mollusca; Gastropoda) From the Afon Crafnant, N. Wales. Arch. Hydrobiol.112(2): 299-316.
Zinc	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1991. Snell, T.W.. New Rotifer Bioassays for Aquatic Toxicology. Final Rep., U.S.Army Med.Res.and Dev.Command, Ft.Detrick, Frederick, MD: 29 p..
Zinc	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1991. Snell, T.W., B.D. Moffat, C. Janssen, and G. Persoone. Acute Toxicity Tests Using Rotifers IV. Effects of Cyst Age, Temperature, and Salinity on the Sensitivity of Brachionus calyciflorus. Ecotoxicol. Environ. Saf.21(3): 308-317.
Zinc chloride (ZnCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1656.8		NC	ug/L	LAB	1997. Nelson, S.M., and R.A. Roline. Comparison of Rapid Toxicity Tests with a Standard Acute Test. Report BR-EE010, Technical Service Center, Bureau of Reclamation, Denver, CO.: 12 p..
Zinc chloride (ZnCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1656.8	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Zinc chloride (ZnCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1320	NA	NR	ug/L	LAB	1989. Couillard, Y., P. Ross, and B. Pinel-Alloul. Acute Toxicity of Six Metals to the Rotifer Brachionus calyciflorus, with Comparisons to Other Freshwater Organisms. Toxic. Assess.4(4): 451-462.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	2271		NC	ug/L	LAB	2007. Juarez-Franco, M.F., S.S.S. Sarma, and S. Nandini. Effect of Cadmium and Zinc on the Population Growth of Brachionus havanaensis (Rotifera: Brachionidae). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control42(10): 1489-1493.
Sulfuric acid, Zinc salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	860	NA	NR	ug/L	LAB	1994. Crisinel, A., L. Delaunay, D. Rossel, J. Tarradellas, H. Meyer, H. Saiah, P. Vogel, C. Delisle, and C. Blaise. Cyst-Based Ecotoxicological Tests Using Anostracans: Comparison of Two Species of Streptocephalus. Environ. Toxicol. Water Qual.9(4): 317-326.
Sulfuric acid, Zinc salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1570	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	540	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	610	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	830	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	1550	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rotifer	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	780	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Zinc	Scud	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Growth	NR	Whole Organism	D	NR	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LC25	Not Reported	D	3.29	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Zinc	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2240	NA	NR	ug/L	LAB	1988. De March, B.G.E.. Acute Toxicity of Binary Mixtures of Five Cations (Cu2+, Cd2+, Zn2+, Mg2+, and K+) to the Freshwater Amphipod Gammarus lacustris (Sars): Alternative Descriptive Models. Can. J. Fish. Aquat. Sci.45(4): 625-633.
Zinc	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	73	NA	NR	ug/L	LAB	1995. Phipps, G.L., V.R. Mattson, and G.T. Ankley. Relative Sensitivity of Three Freshwater Benthic Macroinvertebrates to Ten Contaminants. Arch. Environ. Contam. Toxicol.28(3): 281-286.
Zinc	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	222	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.
Zinc	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	56	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	49000	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7800	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5400	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8800	NA	NR	ug/L	LAB	1997. Pantani, C., G. Pannunzio, M. De Cristofaro, A.A. Novelli, and M. Salvatori. Comparative Acute Toxicity of Some Pesticides, Metals, and Surfactants to Gammarus italicus Goedm. and Echinogammarus tibaldii Pink. and Stock (Crustacea: Amphipoda). Bull. Environ. Contam. Toxicol.59(6): 963-967.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8100	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	610	NA	NR	ug/L	LAB	1986. Vincent, M., B. Penicaut, and J. Debord. Comparative Studies on the Toxicity of Metal Chlorides and of a Synthetic Organic Molluscicide, N-Trityl-Morpholine, upon Two Aquatic Amphipod Crustaceans, Gammarus pulex and Echinogammarus berilloni. Ann. Rech. Vet.17(4): 441-446.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6670		NC	ug/L	LAB	2007. Pestana, J.L.T., A. Re, A.J.A. Nogueira, and A.M.V.M. Soares. Effects of Cadmium and Zinc on the Feeding Behaviour of Two Freshwater Crustaceans: Atyaephyra desmarestii (Decapoda) and Echinogammarus meridionalis (Amphipoda). Chemosphere68(8): 1556-1562.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1500*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5400*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5700*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4920		NC	ug/L	LAB	2000. McLoughlin, N., D. Yin, L. Maltby, R.M. Wood, and H. Yu. Evaluation of Sensitivity and Specificity of Two Crustacean Biochemical Biomarkers. Environ. Toxicol. Chem.19(8): 2085-2092.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2630		NC	ug/L	LAB	2000. McLoughlin, N., D. Yin, L. Maltby, R.M. Wood, and H. Yu. Evaluation of Sensitivity and Specificity of Two Crustacean Biochemical Biomarkers. Environ. Toxicol. Chem.19(8): 2085-2092.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2150		NC	ug/L	LAB	2000. McLoughlin, N., D. Yin, L. Maltby, R.M. Wood, and H. Yu. Evaluation of Sensitivity and Specificity of Two Crustacean Biochemical Biomarkers. Environ. Toxicol. Chem.19(8): 2085-2092.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1600		NC	ug/L	LAB	2000. McLoughlin, N., D. Yin, L. Maltby, R.M. Wood, and H. Yu. Evaluation of Sensitivity and Specificity of Two Crustacean Biochemical Biomarkers. Environ. Toxicol. Chem.19(8): 2085-2092.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1380		NC	ug/L	LAB	2000. McLoughlin, N., D. Yin, L. Maltby, R.M. Wood, and H. Yu. Evaluation of Sensitivity and Specificity of Two Crustacean Biochemical Biomarkers. Environ. Toxicol. Chem.19(8): 2085-2092.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	32.1		NC	umol/L	LAB	1998. Spicer, J.I., D. Morritt, and L. Maltby. Effect of Water-Borne Zinc on Osmoregulation in the Freshwater Amphipod Gammarus pulex (L.) from Populations that Differ in Their Sensitivity to Metal Stress. Funct. Ecol.12(2): 242-247.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	79.5		NC	umol/L	LAB	1998. Spicer, J.I., D. Morritt, and L. Maltby. Effect of Water-Borne Zinc on Osmoregulation in the Freshwater Amphipod Gammarus pulex (L.) from Populations that Differ in Their Sensitivity to Metal Stress. Funct. Ecol.12(2): 242-247.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	17100	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Crane, M.. Effect of Zinc on Four Populations and Two Generations of Gammarus pulex (L.). Freshw. Biol.33(1): 119-126.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	436	NR	NR	ug/L	LAB	1999. Eisenhauer, J.B., K.B. Sullivan, and M.J. Lydy. Response of Genotypes of Hyalella azteca to Zinc Toxicity. Bull. Environ. Contam. Toxicol.63(1): 125-132.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Collyard, S.A., G.T. Ankley, R.A. Hoke, and T. Goldenstein. Influence of Age on the Relative Sensitivity of Hyalella azteca to Diazinon, Alkylphenol Ethoxylates, Copper, Cadmium, and Zinc. Arch. Environ. Contam. Toxicol.26(1): 110-113.
Zinc nitrate	Scud	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	77	NR	NR	ug/L	LAB	1990. Bascombe, A.D., J.B. Ellis, D.M. Revitt, and R.B.E. Shutes. The Development of Ecotoxicological Criteria in Urban Catchments. Water Sci. Technol.22(10-11): 173-179.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	3.28	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	190		NC	ug/L	LAB	2006. Wilding, J., and L. Maltby. Relative Toxicological Importance of Aqueous and Dietary Metal Exposure to a Freshwater Crustacean: Implications for Risk Assessment. Environ. Toxicol. Chem.25(7): 1795-1801.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	1290		NC	ug/L	LAB	2006. Wilding, J., and L. Maltby. Relative Toxicological Importance of Aqueous and Dietary Metal Exposure to a Freshwater Crustacean: Implications for Risk Assessment. Environ. Toxicol. Chem.25(7): 1795-1801.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	750		NC	ug/L	LAB	2006. Wilding, J., and L. Maltby. Relative Toxicological Importance of Aqueous and Dietary Metal Exposure to a Freshwater Crustacean: Implications for Risk Assessment. Environ. Toxicol. Chem.25(7): 1795-1801.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LR25	Not Reported	T	3.08	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LR25	Not Reported	T	5.56	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	3.84	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	LR50	Not Reported	T	6.93	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	NOEC	Not Reported	D	2.61	NR	NR	umol/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Zinc	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1996. Ankley, G.T., K. Liber, D.J. Call, T.P. Markee, T.J. Canfield, and C.G. Ingersoll. A Field Investigation of the Relationship Between Zinc and Acid Volatile Sulfide Concentrations in Freshwater Sediments. J. Aquat. Ecosyst. Health5: 255-264.
Zinc	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	185	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Zinc	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	68	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Zinc	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	108	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Zinc	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	51	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Zinc chloride (ZnCl2)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	1997. Borgmann, U., and W.P. Norwood. Toxicity and Accumulation of Zinc and Copper in Hyalella azteca Exposed to Metal-Spiked Sediments. Can. J. Fish. Aquat. Sci.54: 1046-1054.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR		NC	umol/L	LAB	1998. Spicer, J.I., D. Morritt, and L. Maltby. Effect of Water-Borne Zinc on Osmoregulation in the Freshwater Amphipod Gammarus pulex (L.) from Populations that Differ in Their Sensitivity to Metal Stress. Funct. Ecol.12(2): 242-247.

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Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR		NC	umol/L	LAB	1998. Spicer, J.I., D. Morritt, and L. Maltby. Effect of Water-Borne Zinc on Osmoregulation in the Freshwater Amphipod Gammarus pulex (L.) from Populations that Differ in Their Sensitivity to Metal Stress. Funct. Ecol.12(2): 242-247.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR	Not Reported	T	1500	NA	NR	ug/L	LAB	1993. Xu, Q., and D. Pascoe. Autoradiographic Study of Zinc in Gammarus pulex (Amphipoda). In: R.Dallinger and P.S.Rainbow (Eds.), Ecotoxicology of Metals in Invertebrates, Lewis Publ.: 187-199.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	76.2		NC	umol/L	LAB	1998. Spicer, J.I., D. Morritt, and L. Maltby. Effect of Water-Borne Zinc on Osmoregulation in the Freshwater Amphipod Gammarus pulex (L.) from Populations that Differ in Their Sensitivity to Metal Stress. Funct. Ecol.12(2): 242-247.
Zinc	Scud	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Borgmann, U., W.P. Norwood, and C. Clarke. Accumulation, Regulation and Toxicity of Copper, Zinc, Lead and Mercury in Hyalella azteca. Hydrobiologia259: 79-89.
Sulfuric acid, Zinc salt (1:1)	Scud	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Maltby, L., and C. Naylor. Preliminary Observations on the Ecological Relevance of the Gammarus `Scope for Growth' Assay: Effect of Zinc on Reproduction. Funct. Ecol.4(3): 393-397.
Zinc	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	10200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Zinc	Scud, Amphipod	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	8100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Sulfuric acid, Zinc salt (1:1)	Seep Mudalia	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1580		NC	ug/L	FIELDA	1986. Farris, J.L.. Cellulolytic Responses to Heavy-Metal Accumulation in Corbicula fluminea and Mudalia dilatata. Ph.D.Thesis, Va.Polytechnic Inst.and State Univ., Blacksburg, VA: 185 p..
Sulfuric acid, Zinc salt (1:1)	Seep Mudalia	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2070		NC	ug/L	LAB	1986. Farris, J.L.. Cellulolytic Responses to Heavy-Metal Accumulation in Corbicula fluminea and Mudalia dilatata. Ph.D.Thesis, Va.Polytechnic Inst.and State Univ., Blacksburg, VA: 185 p..
Sulfuric acid, Zinc salt (1:1)	Seep Mudalia	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2430		NC	ug/L	LAB	1986. Farris, J.L.. Cellulolytic Responses to Heavy-Metal Accumulation in Corbicula fluminea and Mudalia dilatata. Ph.D.Thesis, Va.Polytechnic Inst.and State Univ., Blacksburg, VA: 185 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4650	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	7100	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	130000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	36000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5600	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6800	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6900	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1974. Thorp, V.J., and P.S. Lake. Toxicity Bioassays of Cadmium on Selected Freshwater Invertebrates and the Interaction of Cadmium and Zinc on the Freshwater Shrimp, Paratya. Aust. J. Mar. Freshw. Res.25(1): 97-104.
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4900	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4700	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	860	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	760	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid, Zinc salt (1:1)	Shrimp	Crustaceans	NR	Mortality	LC50	Not Reported	T	76000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Zinc chloride (ZnCl2)	Snail	Molluscs	Fresh	Growth	EC50	Not Reported	T	103	NA	NR	ug/L	LAB	1995. Dorgelo, J., H. Meester, and C. Van Velzen. Effects of Diet and Heavy Metals on Growth Rate and Fertility in the Deposit-Feeding Snail Potamopyrgus jenkinsi (Smith) (Gastropoda: Hydrobiidae). Hydrobiologia316(3): 199-210.
Zinc chloride (ZnCl2)	Snail	Molluscs	Fresh	Growth	LOEC	Not Reported	T	71.5	NA	NR	ug/L	LAB	1995. Dorgelo, J., H. Meester, and C. Van Velzen. Effects of Diet and Heavy Metals on Growth Rate and Fertility in the Deposit-Feeding Snail Potamopyrgus jenkinsi (Smith) (Gastropoda: Hydrobiidae). Hydrobiologia316(3): 199-210.
Zinc chloride (ZnCl2)	Snail	Molluscs	Fresh	Growth	NOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Dorgelo, J., H. Meester, and C. Van Velzen. Effects of Diet and Heavy Metals on Growth Rate and Fertility in the Deposit-Feeding Snail Potamopyrgus jenkinsi (Smith) (Gastropoda: Hydrobiidae). Hydrobiologia316(3): 199-210.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	1960. Academy of Natural Sciences. The Sensitivity of Aquatic Life to Certain Chemicals Commonly Found in Industrial Wastes. Final Rep.No.RG-3965(C2R1), U.S.Public Health Service Grant, Acad.of Nat.Sci., Philadelphia, PA: 89 p..
Zinc	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1800	NR	NR	ug/L	LAB	1960. Academy of Natural Sciences. The Sensitivity of Aquatic Life to Certain Chemicals Commonly Found in Industrial Wastes. Final Rep.No.RG-3965(C2R1), U.S.Public Health Service Grant, Acad.of Nat.Sci., Philadelphia, PA: 89 p..
Zinc	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	6200	NR	NR	ug/L	LAB	1960. Academy of Natural Sciences. The Sensitivity of Aquatic Life to Certain Chemicals Commonly Found in Industrial Wastes. Final Rep.No.RG-3965(C2R1), U.S.Public Health Service Grant, Acad.of Nat.Sci., Philadelphia, PA: 89 p..
Zinc	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7100	NR	NR	ug/L	LAB	1960. Academy of Natural Sciences. The Sensitivity of Aquatic Life to Certain Chemicals Commonly Found in Industrial Wastes. Final Rep.No.RG-3965(C2R1), U.S.Public Health Service Grant, Acad.of Nat.Sci., Philadelphia, PA: 89 p..
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5710	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1650	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1900	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4800	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	125900		NC	ug/L	LAB	1985. Gopal, C., and M. Balaparameswara Rao. Copper and Zinc Toxicity and Their Effect on the Activity of the Digestive Enzymes in the Freshwater Snail, Beliamya bengalensis f. annandalei (Kobelt) (Gastropoda: Viviparidae). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 265-281.
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	118900	NA	NR	ug/L	LAB	1987. Rao, M.B., and N. Jayasree. Toxicity of Copper and Zinc to Adults and Juveniles of the Freshwater Prosobranch Snail Bellamya dissimilis (Muller). In: K.S.Rao and S.Shrivasta (Eds.), Perspectives in Hydrobiology Symp., Feb.8-10, 1986, Ujjain, India: 75-80.
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1987. Rao, M.B., and N. Jayasree. Toxicity of Copper and Zinc to Adults and Juveniles of the Freshwater Prosobranch Snail Bellamya dissimilis (Muller). In: K.S.Rao and S.Shrivasta (Eds.), Perspectives in Hydrobiology Symp., Feb.8-10, 1986, Ujjain, India: 75-80.
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4763*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3515*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1764*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	965*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	LC50	Not Reported	T	641*	NA	NR	ug/L	LAB	1981. Gupta, P.K., B.S. Khangarot, and V.S. Durve. Studies on the Acute Toxicity of Some Heavy Metals to an Indian Freshwater Pond Snail Viviparus bengalensis L.. Arch. Hydrobiol.91(2): 259-264.
Zinc chloride (ZnCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	1500	NA	NR	ug/L	LAB	1988. Munzinger, A., and M.L. Guarducci. The Effect of Low Zinc Concentrations on Some Demographic Parameters of Biomphalaria glabrata (Say), Mollusca: Gastropoda. Aquat. Toxicol.12(1): 51-61.
Zinc chloride (ZnCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	1500	NA	NR	ug/L	LAB	1988. Munzinger, A., and M.L. Guarducci. The Effect of Low Zinc Concentrations on Some Demographic Parameters of Biomphalaria glabrata (Say), Mollusca: Gastropoda. Aquat. Toxicol.12(1): 51-61.
Zinc chloride (ZnCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1988. Munzinger, A., and M.L. Guarducci. The Effect of Low Zinc Concentrations on Some Demographic Parameters of Biomphalaria glabrata (Say), Mollusca: Gastropoda. Aquat. Toxicol.12(1): 51-61.
Zinc chloride (ZnCl2)	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1988. Munzinger, A., and M.L. Guarducci. The Effect of Low Zinc Concentrations on Some Demographic Parameters of Biomphalaria glabrata (Say), Mollusca: Gastropoda. Aquat. Toxicol.12(1): 51-61.
Zinc nitrate	Snail	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Zinc chloride (ZnCl2)	Snail	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NA	NR	ug/L	LAB	1988. Munzinger, A., and M.L. Guarducci. The Effect of Low Zinc Concentrations on Some Demographic Parameters of Biomphalaria glabrata (Say), Mollusca: Gastropoda. Aquat. Toxicol.12(1): 51-61.
Sulfuric acid, Zinc salt (1:1)	Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	37500		NC	ug/L	LAB	1985. Gopal, C., and M. Balaparameswara Rao. Copper and Zinc Toxicity and Their Effect on the Activity of the Digestive Enzymes in the Freshwater Snail, Beliamya bengalensis f. annandalei (Kobelt) (Gastropoda: Viviparidae). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 265-281.
Zinc nitrate	Snail	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	1250	NA	NR	ug/L	LAB	1995. Tomasik, P., C.M. Magadza, S. Mhizha, A. Chirume, M.F. Zaranyika, and S. Muchiriri. Metal-Metal Interactions in Biological Systems. Part IV. Freshwater Snail Bulinus globosus. Water Air Soil Pollut.83(1-2): 123-145.
Zinc chloride (ZnCl2)	Snail	Molluscs	Fresh	Reproduction	NR		T	500	NA	NR	ug/L	LAB	1988. Munzinger, A., and M.L. Guarducci. The Effect of Low Zinc Concentrations on Some Demographic Parameters of Biomphalaria glabrata (Say), Mollusca: Gastropoda. Aquat. Toxicol.12(1): 51-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11070	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11070	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	12660	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5290	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	11070	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1880	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	5290	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	8070	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1270	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1480	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3030	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	960	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1270	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1270	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	3030	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Bellmouth Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	870	NA	NR	ug/L	LAB	1962. Wurtz, C.B.. Zinc Effects on Fresh-Water Mollusks. Nautilus76: 53-61.
Sulfuric acid, Zinc salt (1:1)	Snail, Marsh Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	13000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Snail, Marsh Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Snail, Marsh Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Snail, Marsh Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Snail, Marsh Rams-Horn	Molluscs	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Soil Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	147400	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Sulfuric acid, Zinc salt (1:1)	Soil Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	33900	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Sulfuric acid, Zinc salt (1:1)	Soil Protozoan	Invertebrates	Fresh	Mortality	LC50	Not Reported	T	78700	NR	NR	ug/L	LAB	2009. Rico, D., A. Martin-Gonzalez, S. Diaz, P. De Lucas, and J.C. Gutierrez. Heavy Metals Generate Reactive Oxygen Species in Terrestrial and Aquatic Ciliated Protozoa. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.149(1): 90-96.
Zinc chloride (ZnCl2)	Southern Fatmucket	Molluscs	Fresh	Mortality	LC50	Not Reported	T	287	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Zinc chloride (ZnCl2)	Southern Rainbow Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	195	NR	NR	ug/L	LAB	2000. Keller, A.E.. Personal Communication to U.S. EPA: Water Quality and Toxicity Data for Unpublished Unionid Mussel Tests. Memo to R.Pepin and C.Roberts,U.S.EPA Region 5,Chicago, IL: 14 p..
Zinc	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	16800	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Zinc	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	28100	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Zinc	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	14000	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Zinc	Spire Snail	Molluscs	Fresh	Mortality	LC50*	Not Reported	T	20200	NA	NR	ug/L	LAB	1973. Rehwoldt, R., L. Lasko, C. Shaw, and E. Wirhowski. The Acute Toxicity of Some Heavy Metal Ions Toward Benthic Organisms. Bull. Environ. Contam. Toxicol.10(5): 291-294.
Zinc	Sponge	Invertebrates	Fresh	Mortality	NR-LETH	Not Reported	T	0.0005	NR	NR	M	LAB	1995. Richelle, E., Y. Degoudenne, L. Dejonghe, and G. Van de Vyver. Experimental and Field Studies on the Effect of Selected Heavy Metals on Three Freshwater Sponge Species: Ephydatia fluviatilis, Ephydatia muelleri and Spongilla lacustris. Arch. Hydrobiol.135(2): 209-231.
Sulfuric acid, Zinc salt (1:1)	Stonefly	Insects/Spiders	Fresh	Growth	NR	Not Reported	D	NR	NR	NR	ug/L	NR	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Zinc	Stonefly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Sulfuric acid, Zinc salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	NR	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Sulfuric acid, Zinc salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	13600	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid, Zinc salt (1:1)	Stonefly	Insects/Spiders	Fresh	Mortality	NR-ZERO	Not Reported	D	13600	NR	NR	ug/L	LAB	1973. Nehring, R.B.. Heavy Metal Toxicity in Two Species of Aquatic Insects. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 82 p..
Zinc	Swan Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Pynnonen, K.. Effect of pH, Hardness and Maternal Pre-exposure on the Toxicity of Cd, Cu and Zn to the Glochidial Larvae of a Freshwater Clam Anodonta cygnea. Water Res.29(1): 247-254.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Swan Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Pynnonen, K.. Effect of pH, Hardness and Maternal Pre-exposure on the Toxicity of Cd, Cu and Zn to the Glochidial Larvae of a Freshwater Clam Anodonta cygnea. Water Res.29(1): 247-254.
Sulfuric acid, Zinc salt (1:1)	Swan Mussel	Molluscs	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	2006. Lopes-Lima, M., G. Moura, B. Pratoomchat, and J. Machado. Correlation Between the Morpho-Cytohistochemistry of the Outer Mantle Epithelium of Anodonta cygnea with Seasonal Variations and Following Pollutant Exposure. Mar. Freshw. Behav. Physiol.39(3): 235-243.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	13380		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	20810		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	23670		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	9530		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	12400		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	17830		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	20810		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	5440		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	12400		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	17150		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	3720		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	9160		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	10990		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	14740		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	3370		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	EC50	Not Reported	T	5650		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Zinc chloride (ZnCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	200000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Zinc chloride (ZnCl2)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	130000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Four Heavy Metals to Benthic Fish Food Organisms From the River Khan, Ujjain. Int. J. Environ. Stud.15(1): 59-61.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	3640	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	4620	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	75800	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	2570	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	2980	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	LC50	Not Reported	T	60200	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Effects of Heavy Metals on Survival and Respiration Rate of Tubificid Worms: Part 1 - Effects on Survival. Environ. Pollut.13(1): 65-72.
Zinc chloride (ZnCl2)	Tubificid Worm	Worms	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Fleming, T.P., and K.S. Richards. Uptake and Surface Adsorption of Zinc by the Fresh-Water Tubificid Oligochaete Tubifex tubifex. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.71(1): 69-75.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	10000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	18000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	18000		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	32000		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-LETH	Not Reported	T	32000		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	320		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	320		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	1000		NC	ug/L	LAB	2003. Rathore, R.S., and B.S. Khangarot. Effects of Water Hardness and Metal Concentration on a Freshwater Tubifex tubifex Muller. Water Air Soil Pollut.142(1-4): 341-356.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	1800		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm	Worms	Fresh	Mortality	NR-ZERO	Not Reported	T	5600		NC	ug/L	LAB	2002. Rathore, R.S., and B.S. Khangarot. Effects of Temperature on the Sensitivity of Sludge Worm Tubifex tubifex Muller to Selected Heavy Metals. Ecotoxicol. Environ. Saf.53(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Tubificid Worm, Oligochaete	Worms	Fresh	Mortality	LC50	Not Reported	T	7800	NR	NR	ug/L	LAB	1961. Wurtz, C.B., and C.H. Bridges. Preliminary Results From Macro-Invertebrate Bioassays. Proc. Pa. Acad. Sci.35: 51-56.
Zinc	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	7400	NA	NR	ug/L	LAB	1974. See, C.L., A.L.,Jr. Buikema, and J.,Jr. Cairns. The Effects of Selected Toxicants on Survival of Dugesia tigrina (Turbellaria). ASB (Assoc. Southeast. Biol.) Bull.21(2): 82.
Sulfuric acid, Zinc salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	7100	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..
Sulfuric acid, Zinc salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	5480	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..
Sulfuric acid, Zinc salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	5480	NA	NR	ug/L	LAB	1976. See, C.L.. The Effect of Sublethal Concentrations of Selected Toxicants on the Negative Phototactic Response of Dugesia tigrina. Ph.D.Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA: 79 p..
Sulfuric acid, Zinc salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	13000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Turbellarian, Flatworm	Worms	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	170		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	T	115		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Growth	LOEC	Whole Organism	D	120	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	115		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Growth	NOEC	Whole Organism	T	80		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	T	490000		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., M. Canli, V. Van Lierde, I. Forrez, F. Vanhaecke, and C.R. Janssen. Reproductive Toxicity of Dietary Zinc to Daphnia magna. Aquat. Toxicol.70(3): 233-244.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	D	729		NC	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	D	729		NC	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	D	729		NC	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	D	729		NC	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
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Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	D	729		NC	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	D	729		NC	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	D	729		NC	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
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Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	D	729	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	D	729	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
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Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NOEL	Whole Organism	D	729	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Zinc	Water Flea	Crustaceans	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..
Zinc	Water Flea	Crustaceans	Fresh	Growth	NR		T	150	NA	NR	ug/L	LAB	1991. Munzinger, A., and F. Monicelli. A Comparison of the Sensitivity of Three Daphnia magna Populations Under Chronic Heavy Metal Stress. Ecotoxicol. Environ. Saf.22: 24-31.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	T	800	NR	NR	ug/L	LAB	1998. Johnson, I., and P. Delaney. Development of a 7-Day Daphnia magna Growth Test Using Image Analysis. Bull. Environ. Contam. Toxicol.61: 355-362.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	T	400	NR	NR	ug/L	LAB	1998. Johnson, I., and P. Delaney. Development of a 7-Day Daphnia magna Growth Test Using Image Analysis. Bull. Environ. Contam. Toxicol.61: 355-362.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1986. Berglind, R.. Combined and Separate Effects of Cadmium, Lead and Zinc on Ala-D Activity, Growth and Hemoglobin Content in Daphnia magna. Environ. Toxicol. Chem.5: 989-995.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Growth	NR		T	200	NA	NR	ug/L	LAB	1981. Winner, R.W.. A Comparison of Body Length, Brood Size and Longevity as Indices of Chronic Copper and Zinc Stresses in Daphnia magna. Environ. Pollut. A.26: 33-37.
Zinc bacitracin	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	A	126360	NR	NR	ug/L	LAB	1992. Dojmi di Delupis, G., A. Macri, C. Civitareale, and L. Migliore. Antibiotics of Zootechnical Use: Effects of Acute high and Low Dose Contamination on Daphnia magna Straus. Aquat. Toxicol.22: 53-60.

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Zinc bacitracin	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	A	30480	NR	NR	ug/L	LAB	1992. Dojmi di Delupis, G., A. Macri, C. Civitareale, and L. Migliore. Antibiotics of Zootechnical Use: Effects of Acute high and Low Dose Contamination on Daphnia magna Straus. Aquat. Toxicol.22: 53-60.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	882.9	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	D	NR		NC	mM	LAB	2002. Heijerick, D.G., K.A.C. De Schamphelaere, and C.R. Janssen. Predicting Acute Zinc Toxicity for Daphnia magna as a Function of Key Water Chemistry Characteristics: Development and Validation of a Biotic Ligand Model. Environ. Toxicol. Chem.21(6): 1309-1315.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	D	NR		NC	mM	LAB	2002. Heijerick, D.G., K.A.C. De Schamphelaere, and C.R. Janssen. Predicting Acute Zinc Toxicity for Daphnia magna as a Function of Key Water Chemistry Characteristics: Development and Validation of a Biotic Ligand Model. Environ. Toxicol. Chem.21(6): 1309-1315.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	D	NR		NC	mM	LAB	2002. Heijerick, D.G., K.A.C. De Schamphelaere, and C.R. Janssen. Predicting Acute Zinc Toxicity for Daphnia magna as a Function of Key Water Chemistry Characteristics: Development and Validation of a Biotic Ligand Model. Environ. Toxicol. Chem.21(6): 1309-1315.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	D	NR		NC	mM	LAB	2002. Heijerick, D.G., K.A.C. De Schamphelaere, and C.R. Janssen. Predicting Acute Zinc Toxicity for Daphnia magna as a Function of Key Water Chemistry Characteristics: Development and Validation of a Biotic Ligand Model. Environ. Toxicol. Chem.21(6): 1309-1315.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	11.4		NC	uM	LAB	2002. Heijerick, D.G., K.A.C. De Schamphelaere, and C.R. Janssen. Predicting Acute Zinc Toxicity for Daphnia magna as a Function of Key Water Chemistry Characteristics: Development and Validation of a Biotic Ligand Model. Environ. Toxicol. Chem.21(6): 1309-1315.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	22.7		NC	uM	LAB	2002. Heijerick, D.G., K.A.C. De Schamphelaere, and C.R. Janssen. Predicting Acute Zinc Toxicity for Daphnia magna as a Function of Key Water Chemistry Characteristics: Development and Validation of a Biotic Ligand Model. Environ. Toxicol. Chem.21(6): 1309-1315.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	8.4		NC	uM	LAB	2002. Heijerick, D.G., K.A.C. De Schamphelaere, and C.R. Janssen. Predicting Acute Zinc Toxicity for Daphnia magna as a Function of Key Water Chemistry Characteristics: Development and Validation of a Biotic Ligand Model. Environ. Toxicol. Chem.21(6): 1309-1315.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	NR		NC	mM	LAB	2002. Heijerick, D.G., K.A.C. De Schamphelaere, and C.R. Janssen. Predicting Acute Zinc Toxicity for Daphnia magna as a Function of Key Water Chemistry Characteristics: Development and Validation of a Biotic Ligand Model. Environ. Toxicol. Chem.21(6): 1309-1315.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	160		NC	ug/L	LAB	2006. Oda, S., N. Tatarazako, H. Watanabe, M. Morita, and T. Iguchi. Genetic Differences in the Production of Male Neonates in Daphnia magna Exposed to Juvenile Hormone Analogs. Chemosphere63(9): 1477-1484.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	400		NC	ug/L	LAB	2006. Oda, S., N. Tatarazako, H. Watanabe, M. Morita, and T. Iguchi. Genetic Differences in the Production of Male Neonates in Daphnia magna Exposed to Juvenile Hormone Analogs. Chemosphere63(9): 1477-1484.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	590		NC	ug/L	LAB	2006. Oda, S., N. Tatarazako, H. Watanabe, M. Morita, and T. Iguchi. Genetic Differences in the Production of Male Neonates in Daphnia magna Exposed to Juvenile Hormone Analogs. Chemosphere63(9): 1477-1484.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	5500	NA	NR	ug/L	LAB	1996. Sorvari, J., and M. Sillanpaa. Influence of Metal Complex Formation on Heavy Metal and Free EDTA and DTPA Acute Toxicity Determined by Daphnia magna. Chemosphere33(6): 1119-1127.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	60.5	NR	NR	ug/L	LAB	1995. Bitton, G., K. Rhodes, B. Koopman, and M. Cornejo. Short-Term Toxicity Assay Based on Daphnid Feeding Behavior. Water Environ. Res.67(3): 290-293.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	EC50	Not Reported	T	81.6	NR	NR	ug/L	LAB	1997. Lee, S.I., E.J. Na, Y.O. Cho, B. Koopman, and G. Bitton. Short-Term Toxicity Test Based on the Algal Uptake by Ceriodaphnia dubia. Water Environ. Res.69: 1207-1210.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	1000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC0	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	324		NC	ug/L	LAB	2005. Tsui, M.T.K., W.X. Wang, and L.M. Chu. Influence of Glyphosate and Its Formulation (Roundup) on the Toxicity and Bioavailability of Metals to Ceriodaphnia dubia. Environ. Pollut.138(1): 59-68.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	125	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	250	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	1000	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	125	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	2500	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC100	Not Reported	T	50	NA	NR	ug/L	LAB	1977. Shcherban, E.P.. Toxicity of Some Heavy Metals for Daphnia magna Strauss, as a Function of Temperature. Hydrobiol. J.13(4): 75-80.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC15	Not Reported	T	1.88	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC15	Not Reported	T	1.19	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC15	Not Reported	T	11	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC15	Not Reported	T	2.63	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	101	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	105	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	109	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	123	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	131	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	153	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	65	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	114	NA	NR	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	264	D	180	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	96	NA	NR	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	76	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	224	NA	NR	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	10740	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6704	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2290	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	437.5	NA	NR	ug/L	LAB	1988. Vardia, H.K., P.S. Rao, and V.S. Durve. Effect of Copper, Cadmium and Zinc on Fish-Food Organisms, Daphnia lumholtzi and Cypris subglobosa. Proc. Indian Acad. Sci. Anim. Sci.97(2): 175-180.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2850		NC	ug/L	LAB	1990. Fisher, D.J., D.T. Burton, and R.L. Paulson. Acute Toxicity of a Complex Mixture of Synthetic Hexachloroethane (HC) Smoke Combustion Products: II. Determination of Component Toxicity. Environ. Toxicol. Chem.9(6): 755-760.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3580		NC	ug/L	LAB	1990. Fisher, D.J., D.T. Burton, and R.L. Paulson. Acute Toxicity of a Complex Mixture of Synthetic Hexachloroethane (HC) Smoke Combustion Products: II. Determination of Component Toxicity. Environ. Toxicol. Chem.9(6): 755-760.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	2000. De la Torre, A.I., J.A. Jimqnez, M. Carballo, C. Fernandez, J. Roset, and M.J. Munoz. Ecotoxicological Evaluation of Pig Slurry. Chemosphere41(10): 1629-1635.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1590	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	68	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	570	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	107	NA	NR	ug/L	LAB	1984. Mount, D.I., and T.J. Norberg. A Seven-Day Life-Cycle Cladoceran Toxicity Test. Environ. Toxicol. Chem.3(3): 425-434.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	169.7		NC	ug/L	LAB	1997. Nelson, S.M., and R.A. Roline. Comparison of Rapid Toxicity Tests with a Standard Acute Test. Report BR-EE010, Technical Service Center, Bureau of Reclamation, Denver, CO.: 12 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	127.7		NC	ug/L	LAB	1997. Nelson, S.M., and R.A. Roline. Comparison of Rapid Toxicity Tests with a Standard Acute Test. Report BR-EE010, Technical Service Center, Bureau of Reclamation, Denver, CO.: 12 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	110		NC	ug/L	LAB	2005. Mahar, A.M., and M.C. Watzin. Effects of Metal and Organophosphate Mixtures on Ceriodaphnia dubia Survival and Reproduction. Environ. Toxicol. Chem.24(7): 1579-1586.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	122		NC	ug/L	LAB	2005. Mahar, A.M., and M.C. Watzin. Effects of Metal and Organophosphate Mixtures on Ceriodaphnia dubia Survival and Reproduction. Environ. Toxicol. Chem.24(7): 1579-1586.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.61	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.85	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	169.7	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	163	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Evaluation of Site-Specific Criteria for Copper and Zinc: An Integration of Metal Addition Toxicity, Effluent and Receiving Water Toxicity, and Ecological Survey Data. EPA-600/3-86-026, U.S.EPA, Duluth, MN: 68 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.49	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1.61	NR	NR	uM	LAB	1996. Hockett, J.R., and D.R. Mount. Use of Metal Chelating Agents to Differentiate Among Sources of Acute Aquatic Toxicity. Environ. Toxicol. Chem.15(10): 1687-1693.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3.99	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	127.7	NA	NR	ug/L	LAB	1998. Nelson, S.M., and R.A. Roline. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. Bull. Environ. Contam. Toxicol.60: 292-299.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	149	D	145	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Evaluation of Site-Specific Criteria for Copper and Zinc: An Integration of Metal Addition Toxicity, Effluent and Receiving Water Toxicity, and Ecological Survey Data. EPA-600/3-86-026, U.S.EPA, Duluth, MN: 68 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	164	D	165	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Evaluation of Site-Specific Criteria for Copper and Zinc: An Integration of Metal Addition Toxicity, Effluent and Receiving Water Toxicity, and Ecological Survey Data. EPA-600/3-86-026, U.S.EPA, Duluth, MN: 68 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	180	D	169	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Evaluation of Site-Specific Criteria for Copper and Zinc: An Integration of Metal Addition Toxicity, Effluent and Receiving Water Toxicity, and Ecological Survey Data. EPA-600/3-86-026, U.S.EPA, Duluth, MN: 68 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	NR	1999. Gillespie, W.B.J., W.B. Hawkins, J.H.,Jr. Rodgers, M.L. Cano, and P.B. Dorn. Transfers and Transformations of Zinc in Flow-Through Wetland Microcosms. Ecotoxicol. Environ. Saf.43(2): 126-132.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1090		NC	ug/L	LAB	2007. Mohammed, A.. Comparative Sensitivities of the Tropical Cladoceran, Ceriodaphnia rigaudii and the Temperate Species Daphnia magna to Seven Toxicants. Toxicol. Environ. Chem.89(2): 347-352.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.66	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5000		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2300		NC	ug/L	LAB	2001. Diamantino, T.C., E. Almeida, A.M.V.M. Soares, and L. Guilhermino. Lactate Dehydrogenase Activity as an Effect Criterion in Toxicity Tests with Daphnia magna Straus. Chemosphere45(4-5): 553-560.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	165		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	77		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	8400		NC	ug/L	LAB	2000. Weltens, R., F. Vanderplaetse, C. Vangenechten, and T. Verhulst. Automated beta Galactosidase Activity Bioassay for Adult Daphnia magna Versus Classic Immobilization Test. Bull. Environ. Contam. Toxicol.65(2): 139-146.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	210		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1800		NC	ug/L	LAB	2007. Mohammed, A.. Comparative Sensitivities of the Tropical Cladoceran, Ceriodaphnia rigaudii and the Temperate Species Daphnia magna to Seven Toxicants. Toxicol. Environ. Chem.89(2): 347-352.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	46.2		NC	uM	LAB	2005. Canli, M.. Dietary and Water-Borne Zn Exposures Affect Energy Reserves and Subsequent Zn Tolerance of Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.141(1): 110-116.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	48.2		NC	uM	LAB	2005. Canli, M.. Dietary and Water-Borne Zn Exposures Affect Energy Reserves and Subsequent Zn Tolerance of Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.141(1): 110-116.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	50.4		NC	uM	LAB	2005. Canli, M.. Dietary and Water-Borne Zn Exposures Affect Energy Reserves and Subsequent Zn Tolerance of Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.141(1): 110-116.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	54.3		NC	uM	LAB	2005. Canli, M.. Dietary and Water-Borne Zn Exposures Affect Energy Reserves and Subsequent Zn Tolerance of Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.141(1): 110-116.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60.4		NC	uM	LAB	2005. Canli, M.. Dietary and Water-Borne Zn Exposures Affect Energy Reserves and Subsequent Zn Tolerance of Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.141(1): 110-116.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	60.8		NC	uM	LAB	2005. Canli, M.. Dietary and Water-Borne Zn Exposures Affect Energy Reserves and Subsequent Zn Tolerance of Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.141(1): 110-116.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70.8		NC	uM	LAB	2005. Canli, M.. Dietary and Water-Borne Zn Exposures Affect Energy Reserves and Subsequent Zn Tolerance of Daphnia magna. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.141(1): 110-116.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	800		NC	ug/L	LAB	2001. Diamantino, T.C., E. Almeida, A.M.V.M. Soares, and L. Guilhermino. Lactate Dehydrogenase Activity as an Effect Criterion in Toxicity Tests with Daphnia magna Straus. Chemosphere45(4-5): 553-560.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	164		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	861.06	NA	NR	ug/L	LAB	1982. Attar, E.N., and E.J. Maly. Acute Toxicity of Cadmium, Zinc, and Cadmium-Zinc Mixtures to Daphnia magna. Arch. Environ. Contam. Toxicol.11(3): 291-296.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	798.94	NA	NR	ug/L	LAB	1982. Attar, E.N., and E.J. Maly. Acute Toxicity of Cadmium, Zinc, and Cadmium-Zinc Mixtures to Daphnia magna. Arch. Environ. Contam. Toxicol.11(3): 291-296.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	210	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	334	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	525	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	655	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	12.54	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	47700	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	420.25	NA	NR	ug/L	LAB	1982. Attar, E.N., and E.J. Maly. Acute Toxicity of Cadmium, Zinc, and Cadmium-Zinc Mixtures to Daphnia magna. Arch. Environ. Contam. Toxicol.11(3): 291-296.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	840	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	126.1	NA	NR	ug/L	LAB	1982. Attar, E.N., and E.J. Maly. Acute Toxicity of Cadmium, Zinc, and Cadmium-Zinc Mixtures to Daphnia magna. Arch. Environ. Contam. Toxicol.11(3): 291-296.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	67.91	NA	NR	ug/L	LAB	1982. Attar, E.N., and E.J. Maly. Acute Toxicity of Cadmium, Zinc, and Cadmium-Zinc Mixtures to Daphnia magna. Arch. Environ. Contam. Toxicol.11(3): 291-296.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	740	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	232.488	NA	NR	ug/L	LAB	1990. Jindal, R., and A. Verma. Heavy Metal Toxicity to Daphnia pulex. Indian J. Environ. Health32(3): 289-292.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4.18	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1976. Lee, D.R.. Development of an Invertebrate Bioassay to Screen Petroleum Refinery Effluents Discharged into Freshwater. Ph.D.Thesis, Virginia Polytechnic Inst.and State Univ., Blacksburg, VA: 108 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4500	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1980. Qureshi, S.A., A.B. Saksena, and V.P. Singh. Acute Toxicity of Some Heavy Metals to Fish Food Organisms. Int. J. Environ. Stud.14(4): 325-327.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	119.4	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	147.3	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	182.31	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	254.86	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	306.49	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	327.27	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	81.28	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	152.51	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	205.31	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	49.99	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	59.24	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	77.46	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	92.88	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	124.59	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	33.79	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	70.05	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	102.87	NA	NR	ug/L	LAB	1994. Zou, E., and S. Bu. Acute Toxicity of Copper, Cadmium, and Zinc to the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.52(5): 742-748.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1010		NC	ug/L	LAB	2007. Nandini, S., E.A. Picazo-Paez, and S.S.S. Sarma. The Combined Effects of Heavy Metals (Copper and Zinc), Temperature and Food (Chlorella vulgaris) Level on the Demographic Characters of Moina macrocopa (Crustacea: Cladocera). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control42(10): 1433-1442.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	95	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	199.3	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	173.5	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1400	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2300	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	339.8	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	57	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	123	NR	NR	ug/L	LAB	1994. Mukhopadhyay, M.K., B.B. Ghosh, and M.M. Bacchi. Toxicity of Heavy Metals to Fish, Prawn and Fish Food Organisms of Hooghly Estuarine System. Geobios21(1): 13-17.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1974. Baudouin, M.F., and P. Scoppa. Acute Toxicity of Various Metals to Freshwater Zooplankton. Bull. Environ. Contam. Toxicol.12(6): 745-751.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	21.8		NC	ug/L	LAB	2002. Bianchini, A., K.C. Bowles, C.J. Brauner, J.W. Gorsuch, J.R. Kramer, and C.M. Wood. Evaluation of the Effect of Reactive Sulfide on the Acute Toxicity of Silver (I) to Daphnia magna. Part 2: Toxicity Results. Environ. Toxicol. Chem.21(6): 1294-1300.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	620		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6037		NC	ug/L	LAB	2002. McWilliam, R.A., and D.J. Baird. Postexposure Feeding Depression: A new Toxicity Endpoint for Use in Laboratory Studies with Daphnia magna. Environ. Toxicol. Chem.21(6): 1198-1205.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	6590		NC	ug/L	LAB	2002. McWilliam, R.A., and D.J. Baird. Postexposure Feeding Depression: A new Toxicity Endpoint for Use in Laboratory Studies with Daphnia magna. Environ. Toxicol. Chem.21(6): 1198-1205.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	35403	NR	NR	ug/L	LAB	2000. Guilhermino, L., T. Diamantino, M.C. Silva, and A.M.V.M. Soares. Acute Toxicity Test with Daphnia magna: An Alternative to Mammals in the Prescreening of Chemical Toxicity?. Ecotoxicol. Environ. Saf.46(3): 357-362.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1170	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	790	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	920	NA	NR	ug/L	LAB	1986. Hall, W.S., K.L. Dickson, F.Y. Saleh, J.H.,Jr. Rodgers, D. Wilcox, and A. Entazami. Effects of Suspended Solids on the Acute Toxicity of Zinc to Daphnia magna and Pimephales promelas. Water Resour. Bull.22(6): 913-920.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	1999. Sankaramanachi, S.K., and S.R. Qasim. Metal Toxicity Evaluation Using Bioassay and Microtox. Int. J. Environ. Stud.56(2): 187-199.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	4029	NR	NR	ug/L	LAB	2000. Guilhermino, L., T. Diamantino, M.C. Silva, and A.M.V.M. Soares. Acute Toxicity Test with Daphnia magna: An Alternative to Mammals in the Prescreening of Chemical Toxicity?. Ecotoxicol. Environ. Saf.46(3): 357-362.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	0.01151	NA	NR	mmol/L	LAB	1995. Arambasic, M.B., S. Bjelic, and G. Subakov. Acute Toxicity of Heavy Metals (Copper, Lead, Zinc), Phenol and Sodium on Allium cepa L.., Lepidium sativum L. and Daphnia magna St.: Comparative Investigations and the Practical Applications. Water Res.29(2): 497-503.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	620	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1060	L	878	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1210	NR	NR	ug/L	LAB	1998. Aquatic Toxicology Group. Brenda Mines Sulphate and Molybdenum Toxicity Testing. Proj.Rep.No.2-11-825/826, Prepared for Noranda Mining and Exploration Inc., Brenda Mines Div., B.C.: 222 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	131	L	121	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1450	NR	NR	ug/L	LAB	1998. Aquatic Toxicology Group. Brenda Mines Sulphate and Molybdenum Toxicity Testing. Proj.Rep.No.2-11-825/826, Prepared for Noranda Mining and Exploration Inc., Brenda Mines Div., B.C.: 222 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1990	NR	NR	ug/L	LAB	1998. Aquatic Toxicology Group. Brenda Mines Sulphate and Molybdenum Toxicity Testing. Proj.Rep.No.2-11-825/826, Prepared for Noranda Mining and Exploration Inc., Brenda Mines Div., B.C.: 222 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2090	NR	NR	ug/L	LAB	1998. Aquatic Toxicology Group. Brenda Mines Sulphate and Molybdenum Toxicity Testing. Proj.Rep.No.2-11-825/826, Prepared for Noranda Mining and Exploration Inc., Brenda Mines Div., B.C.: 222 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	259	L	239	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2600	NR	NR	ug/L	LAB	1998. Aquatic Toxicology Group. Brenda Mines Sulphate and Molybdenum Toxicity Testing. Proj.Rep.No.2-11-825/826, Prepared for Noranda Mining and Exploration Inc., Brenda Mines Div., B.C.: 222 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	457	L	378	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	601	L	397	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	962	L	636	ug/L	LAB	1998. Brata, C., D.J. Baird, and S.J. Markich. Influence of Genetic and Environmental Factors on the Tolerance of Daphnia magna Straus to Essential and Non-Essential Metals. Aquat. Toxicol.42(2): 115-137.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	1290	NR	NR	ug/L	LAB	2006. Yim, J.H., K.W. Kim, and S.D. Kim. Effect of Hardness on Acute Toxicity of Metal Mixtures Using Daphnia magna: Prediction of Acid Mine Drainage Toxicity. J. Hazard. Mater.B138(1): 16-21.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	D	300	NR	NR	ug/L	LAB	2006. Yim, J.H., K.W. Kim, and S.D. Kim. Effect of Hardness on Acute Toxicity of Metal Mixtures Using Daphnia magna: Prediction of Acid Mine Drainage Toxicity. J. Hazard. Mater.B138(1): 16-21.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	29400	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	115	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	124	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1200*	NA	NR	ug/L	LAB	1982. Qureshi, A.A., K.W. Flood, S.R. Thompson, S.M. Janhurst, C.S. Inniss, and D.A. Rokosh. Comparison of a Luminescent Bacterial Test with Other Bioassays for Determining Toxicity of Pure Compounds and Complex Effluents. In: J.G.Pearson, R.B.Foster and W.E.Bishop (Eds.), Aquatic Toxicology and Hazard Assessment, 5th Confrence, ASTM STP 766, Philadelphia, PA: 179-195.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	151	NA	NR	ug/L	LAB	1992. Oikari, A., J. Kukkonen, and V. Virtanen. Acute Toxicity of Chemicals to Daphnia magna in Humic Waters. Sci. Total Environ.117-118: 367-377.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1982. LeBlanc, G.A.. Laboratory Investigation into the Development of Resistance of Daphnia magna (Straus) to Environmental Pollutants. Environ. Pollut. A.27(4): 309-322.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	690	NA	NR	ug/L	LAB	1987. Khangarot, B.S., P.K. Ray, and H. Chandra. Daphnia magna as a Model to Assess Heavy Metal Toxicity: Comparative Assessment with Mouse System. Acta Hydrochim. Hydrobiol.15(4): 427-432.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Water Toxicology and Radioecology. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	150*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	270*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	300*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	500*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	940	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	232.8	NA	NR	ug/L	LAB	1984. Flickinger, A.L.. Chronic Toxicity of Mixtures of Copper, Cadmium and Zinc to Daphnia pulex. Ph.D.Thesis, Miami University, Oxford, OH: 135 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	612.2	NA	NR	ug/L	LAB	1984. Flickinger, A.L.. Chronic Toxicity of Mixtures of Copper, Cadmium and Zinc to Daphnia pulex. Ph.D.Thesis, Miami University, Oxford, OH: 135 p..
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	165	NA	NR	ug/L	LAB	1990. Soundrapandian, S., and K. Venkataraman. Effect of Heavy Metal Salts on the Life History of Daphnia similis Claus (Crustacea: Cladocera). Proc. Indian Acad. Sci. Anim. Sci.99(5): 411-418.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1990. Soundrapandian, S., and K. Venkataraman. Effect of Heavy Metal Salts on the Life History of Daphnia similis Claus (Crustacea: Cladocera). Proc. Indian Acad. Sci. Anim. Sci.99(5): 411-418.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	103	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	346.9	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	2040	NR	NR	ug/L	LAB	1992. Wong, C.K.. Effects of Chromium, Copper, Nickel, and Zinc on Survival and Feeding of the Cladoceran Moina macrocopa. Bull. Environ. Contam. Toxicol.49: 593-599.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	246	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1170	NR	NR	ug/L	LAB	1992. Wong, C.K.. Effects of Chromium, Copper, Nickel, and Zinc on Survival and Feeding of the Cladoceran Moina macrocopa. Bull. Environ. Contam. Toxicol.49: 593-599.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	94	NR	NR	ug/L	LAB	1987. Pokethitiyook, P., E.S. Upatham, and O. Leelhaphunt. Acute Toxicity of Various Metals to Moina macrocopa. Nat. Hist. Bull. Siam. Soc.35(1-2): 47-56.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1320	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	1643	NA	NR	ug/L	LAB	1989. Hatakeyama, S., and Y. Sugaya. A Freshwater Shrimp (Paratya compressa improvisa) as a Sensitive Test Organism to Pesticides. Environ. Pollut.59(4): 325-336.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50	Not Reported	T	57.5	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	11600	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	9800	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	8700	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	7700	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	14900	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	10800	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	8100	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	7400	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	NR	Mortality	LC50	Not Reported	T	5100	NR	NR	ug/L	NR	1960. Cabejszek, I., and M. Stasiak. Studies on the Toxic Effects of Some Metals on the Water Biocenosis - Daphnia magna Employed as Index (Part II). Roczyn. Zakl. Hig. Warsaw11: 533-540.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	14	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LC50*	Not Reported	T	5	NA	NR	ug/L	LAB	1979. Braginskij, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates Under Different Temperature Conditions. Hydrobiol. J.14(6): 78-82.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC85	Not Reported	T	8.44	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC85	Not Reported	T	13.43	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC85	Not Reported	T	14.28	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LC85	Not Reported	T	6.61	NR	NR	umol/L	LAB	2006. Shaw, J.R., T.D. Dempsey, C.Y. Chen, J.W. Hamilton, and C.L. Folt. Comparative Toxicity of Cadmium, Zinc, and Mixtures of Cadmium and Zinc to Daphnids. Environ. Toxicol. Chem.25(1): 182-189.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	1000	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	0.1	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD0	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	125	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD100	Not Reported	T	50	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	14	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	5	NR	NR	ug/L	LAB	1978. Braginskiy, L.P., and E.P. Shcherban. Acute Toxicity of Heavy Metals to Aquatic Invertebrates at Different Temperatures. Hydrobiol. J. (Gidrobiol. Zh.)14(6): 78-82.
Zinc nitrate	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	2000	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Zinc nitrate	Water Flea	Crustaceans	Fresh	Mortality	LD50	Not Reported	T	750	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Poynton, H.C., A.V. Loguinov, J.R. Varshavsky, S. Chan, E.J. Perkins, and C.D. Vulpe. Gene Expression Profiling in Daphnia magna. Part I: Concentration-Dependent Profiles Provide Support for the No Observed Transcriptional Effect Level. Environ. Sci. Technol.42(16): 6250-6256.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	D	1000	NR	NR	ug/L	LAB	1991. Enserink, E.L., J.L. Maas-Diepeveen, and C.J. Van Leeuwen. Combined Effects of Metals: An Ecotoxicological Evaluation. Water Res.25(6): 679-687.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	216.4	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	140	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	450	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	LOEC	Not Reported	T	25	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	250		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	250		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	350		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	350		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	750		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	750		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	LOEL	Not Reported	T	350		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	70	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	70	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	140	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	40	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	25	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	25	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	MATC	Not Reported	T	25	NR	NR	ug/L	LAB	1994. Sharma, M.S., and C.S. Selvaraj. Zinc, Lead and Cadmium Toxicity to Selected Freshwater Zooplankters. Pollut. Res.13(2): 191-201.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	1000		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	1000	NR	NR	ug/L	LAB	2008. Poynton, H.C., A.V. Loguinov, J.R. Varshavsky, S. Chan, E.J. Perkins, and C.D. Vulpe. Gene Expression Profiling in Daphnia magna. Part I: Concentration-Dependent Profiles Provide Support for the No Observed Transcriptional Effect Level. Environ. Sci. Technol.42(16): 6250-6256.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	101.1	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	112.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	137.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	162.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	162.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	212.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	87.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NOEC	Not Reported	T	87.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	1000		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NOEL	Not Reported	T	2500		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..
Zinc	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Munzinger, A., and F. Monicelli. A Comparison of the Sensitivity of Three Daphnia magna Populations Under Chronic Heavy Metal Stress. Ecotoxicol. Environ. Saf.22: 24-31.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	110		NC	ug/L	LAB	2005. Mahar, A.M., and M.C. Watzin. Effects of Metal and Organophosphate Mixtures on Ceriodaphnia dubia Survival and Reproduction. Environ. Toxicol. Chem.24(7): 1579-1586.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	122		NC	ug/L	LAB	2005. Mahar, A.M., and M.C. Watzin. Effects of Metal and Organophosphate Mixtures on Ceriodaphnia dubia Survival and Reproduction. Environ. Toxicol. Chem.24(7): 1579-1586.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Bodar, C.W.M., A.V.D. Zee, P.A. Voogt, H. Wynne, and D.I. Zandee. Toxicity of Heavy Metals to Early Life Stages of Daphnia magna. Ecotoxicol. Environ. Saf.17(3): 333-338.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2001. Pretorius, P.J., P.W. Linder, J.L. Slabbert, and P.W. Wade. The Chemical Behaviour of Heavy Metals and Their Bioavailability and Toxicity to Organisms: Implications for Environmental Quality Criteria. S. Afr. J. Sci.97(9-10): 431-434.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2001. Pretorius, P.J., P.W. Linder, J.L. Slabbert, and P.W. Wade. The Chemical Behaviour of Heavy Metals and Their Bioavailability and Toxicity to Organisms: Implications for Environmental Quality Criteria. S. Afr. J. Sci.97(9-10): 431-434.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2001. Pretorius, P.J., P.W. Linder, J.L. Slabbert, and P.W. Wade. The Chemical Behaviour of Heavy Metals and Their Bioavailability and Toxicity to Organisms: Implications for Environmental Quality Criteria. S. Afr. J. Sci.97(9-10): 431-434.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2001. Pretorius, P.J., P.W. Linder, J.L. Slabbert, and P.W. Wade. The Chemical Behaviour of Heavy Metals and Their Bioavailability and Toxicity to Organisms: Implications for Environmental Quality Criteria. S. Afr. J. Sci.97(9-10): 431-434.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2001. Pretorius, P.J., P.W. Linder, J.L. Slabbert, and P.W. Wade. The Chemical Behaviour of Heavy Metals and Their Bioavailability and Toxicity to Organisms: Implications for Environmental Quality Criteria. S. Afr. J. Sci.97(9-10): 431-434.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2001. Pretorius, P.J., P.W. Linder, J.L. Slabbert, and P.W. Wade. The Chemical Behaviour of Heavy Metals and Their Bioavailability and Toxicity to Organisms: Implications for Environmental Quality Criteria. S. Afr. J. Sci.97(9-10): 431-434.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2001. Pretorius, P.J., P.W. Linder, J.L. Slabbert, and P.W. Wade. The Chemical Behaviour of Heavy Metals and Their Bioavailability and Toxicity to Organisms: Implications for Environmental Quality Criteria. S. Afr. J. Sci.97(9-10): 431-434.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2001. Pretorius, P.J., P.W. Linder, J.L. Slabbert, and P.W. Wade. The Chemical Behaviour of Heavy Metals and Their Bioavailability and Toxicity to Organisms: Implications for Environmental Quality Criteria. S. Afr. J. Sci.97(9-10): 431-434.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	2001. Pretorius, P.J., P.W. Linder, J.L. Slabbert, and P.W. Wade. The Chemical Behaviour of Heavy Metals and Their Bioavailability and Toxicity to Organisms: Implications for Environmental Quality Criteria. S. Afr. J. Sci.97(9-10): 431-434.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR	Not Reported	T	125	NA	NR	ug/L	LAB	1986. Winner, R.W., and J.D. Gauss. Relationship Between Chronic Toxicity and Bioaccumulation of Copper, Cadmium and Zinc As Affected by Water Hardness and Humic Acid. Aquat. Toxicol.8(3): 149-161.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	250		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	0.00001	NA	NR	mol/L	LAB	1994. Stom, D.I., and L.D. Zubareva. Comparative Resistance of Daphnia and Epischura to Toxic Substances in Acute Exposure. Hydrobiol. J.30(3): 35-38.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	250	NR	NR	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1700	NA	NR	ug/L	LAB	1992. Pittinger, C.A., D.J. Versteeg, B.A. Blatz, and E.M. Meiers. Environmental Toxicology of Succinate Tartrates. Aquat. Toxicol.24(1-2): 83-102.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	500	NR	NR	ug/L	LAB	2001. Pretorius, P.J., P.W. Linder, J.L. Slabbert, and P.W. Wade. The Chemical Behaviour of Heavy Metals and Their Bioavailability and Toxicity to Organisms: Implications for Environmental Quality Criteria. S. Afr. J. Sci.97(9-10): 431-434.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	D	800	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Zinc nitrate	Water Flea	Crustaceans	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Zinc	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	490000		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., M. Canli, V. Van Lierde, I. Forrez, F. Vanhaecke, and C.R. Janssen. Reproductive Toxicity of Dietary Zinc to Daphnia magna. Aquat. Toxicol.70(3): 233-244.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	80		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	80		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	D	170		NC	ug/L	LAB	2006. Muyssen, B.T.A., K.A.C. De Schamphelaere, and C.R. Janssen. Mechanisms of Chronic Waterborne Zn Toxicity in Daphnia magna. Aquat. Toxicol.77(4): 393-401.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	25.1	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	800	NR	NR	ug/L	LAB	1998. Johnson, I., and P. Delaney. Development of a 7-Day Daphnia magna Growth Test Using Image Analysis. Bull. Environ. Contam. Toxicol.61: 355-362.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	D	1800	NR	NR	ug/L	LAB	2007. Hoang, T.C., and S.J. Klaine. Influence of Organism Age on Metal Toxicity to Daphnia magna. Environ. Toxicol. Chem.26(6): 1198-1204.
Zinc nitrate	Water Flea	Crustaceans	Fresh	Mortality	NR-ZERO	Not Reported	T	500	NR	NR	ug/L	LAB	1995. Tomasik, P., C.H.D. Magadza, S. Mhizha, and A. Chirume. The Metal-Metal Interactions in Biological Systems. Part III. Daphnia magna. Water Air Soil Pollut.82: 695-711.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	126		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	171		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	196		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	265		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	387		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	59.2		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	D	92.7		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	114		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	179		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	233		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	277		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	308		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	313		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	328		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	331		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	341		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	394		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	423		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	502		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	520		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	557		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	600		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	634		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	90		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	911		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	F1 Generation	T	991		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	T	84		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC10	Not Reported	T	85		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	112		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	171		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	242		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	299		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	313		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	473		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	D	536		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	124		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	112		NC	ug/L	LAB	2005. Muyssen, B.T.A., and C.R. Janssen. Importance of Acclimation to Environmentally Relevant Zinc Concentrations on the Sensitivity of Daphnia magna Toward Zinc. Environ. Toxicol. Chem.24(4): 895-901.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	115		NC	ug/L	LAB	2005. Muyssen, B.T.A., and C.R. Janssen. Importance of Acclimation to Environmentally Relevant Zinc Concentrations on the Sensitivity of Daphnia magna Toward Zinc. Environ. Toxicol. Chem.24(4): 895-901.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	115		NC	ug/L	LAB	2005. Muyssen, B.T.A., and C.R. Janssen. Importance of Acclimation to Environmentally Relevant Zinc Concentrations on the Sensitivity of Daphnia magna Toward Zinc. Environ. Toxicol. Chem.24(4): 895-901.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	120		NC	ug/L	LAB	2005. Muyssen, B.T.A., and C.R. Janssen. Importance of Acclimation to Environmentally Relevant Zinc Concentrations on the Sensitivity of Daphnia magna Toward Zinc. Environ. Toxicol. Chem.24(4): 895-901.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	123		NC	ug/L	LAB	2005. Muyssen, B.T.A., and C.R. Janssen. Importance of Acclimation to Environmentally Relevant Zinc Concentrations on the Sensitivity of Daphnia magna Toward Zinc. Environ. Toxicol. Chem.24(4): 895-901.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	124		NC	ug/L	LAB	2005. Muyssen, B.T.A., and C.R. Janssen. Importance of Acclimation to Environmentally Relevant Zinc Concentrations on the Sensitivity of Daphnia magna Toward Zinc. Environ. Toxicol. Chem.24(4): 895-901.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	91		NC	ug/L	LAB	2005. Muyssen, B.T.A., and C.R. Janssen. Importance of Acclimation to Environmentally Relevant Zinc Concentrations on the Sensitivity of Daphnia magna Toward Zinc. Environ. Toxicol. Chem.24(4): 895-901.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	96		NC	ug/L	LAB	2005. Muyssen, B.T.A., and C.R. Janssen. Importance of Acclimation to Environmentally Relevant Zinc Concentrations on the Sensitivity of Daphnia magna Toward Zinc. Environ. Toxicol. Chem.24(4): 895-901.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	1019		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	207		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	245		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	269		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	346		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	350		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	413		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	465		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	476		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	555		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	610		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	644		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	688		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	823		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	F1 Generation	T	828		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	135		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	136		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	249.8	NA	NR	ug/L	LAB	1997. Zou, E.. Effects of Sublethal Exposure to Zinc Chloride on the Reproduction of the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.58(3): 437-441.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	EC50	Not Reported	T	21.8	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	EC50*		T	102	NA	NR	ug/L	LAB	1972. Biesinger, K.E., and G.M. Christensen. Effects of Various Metals on Survival, Growth, Reproduction and Metabolism of Daphnia magna. J. Fish. Res. Board Can.29(12): 1691-1700.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	115		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	115		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	115		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Poynton, H.C., A.V. Loguinov, J.R. Varshavsky, S. Chan, E.J. Perkins, and C.D. Vulpe. Gene Expression Profiling in Daphnia magna. Part I: Concentration-Dependent Profiles Provide Support for the No Observed Transcriptional Effect Level. Environ. Sci. Technol.42(16): 6250-6256.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	50	NA	NR	ug/L	LAB	1997. Zou, E.. Effects of Sublethal Exposure to Zinc Chloride on the Reproduction of the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.58(3): 437-441.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	LOEC	Not Reported	T	25.1	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Juvenile	T	320000		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., M. Canli, V. Van Lierde, I. Forrez, F. Vanhaecke, and C.R. Janssen. Reproductive Toxicity of Dietary Zinc to Daphnia magna. Aquat. Toxicol.70(3): 233-244.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	375		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	375		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	T	400		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	LOEL	Not Reported	D	450		NC	ug/L	LAB	2001. Muyssen, B.T.A., and C.R. Janssen. Multigeneration Zinc Acclimation and Tolerance in Daphnia magna: Implications for Water-Quality Guidelines and Ecological Risk Assessment. Environ. Toxicol. Chem.20(9): 2053-2060.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	20	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	70	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	140	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	MATC	Not Reported	T	70	NA	NR	ug/L	LAB	1991. Masters, J.A., M.A. Lewis, D.H. Davidson, and R.D. Bruce. Validation of a Four-Day Ceriodaphnia Toxicity Test and Statistical Considerations in Data Analysis. Environ. Toxicol. Chem.10: 47-55.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	143		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	155		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	244		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	251		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	491		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	62.6		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	72.7		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	D	94.5		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	100		NC	ug/L	LAB	2007. Poynton, H.C., J.R. Varshavsky, B. Chang, G. Cavigiolio, S. Chan, P.S. Holman, A.V. Loguinov, D.J. Bauer, K. Komachi, E.. Daphnia magna Ecotoxicogenomics Provides Mechanistic Insights into Metal Toxicity. Environ. Sci. Technol.41(3): 1044-1050.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	1000		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	209		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	209		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	320		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	320		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	320		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	320		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.

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Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	320		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	425		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	445		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	445		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	575		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	575		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	630		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	630		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	630		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	F1 Generation	T	630		NC	ug/L	LAB	2003. Heijerick, D.G., C.R. Janssen, and W.M. De Coen. The Combined Effects of Hardness, pH, and Dissolved Organic Carbon on the Chronic Toxicity of Zn to D. magna: Development of a Surface Response Model. Arch. Environ. Contam. Toxicol.44(2): 210-217.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	80		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	80		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	340		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	80		NC	ug/L	LAB	2007. Muyssen, B.T.A., and C.R. Janssen. Age and Exposure Duration as a Factor Influencing Cu and Zn Toxicity Toward Daphnia magna. Ecotoxicol. Environ. Saf.68(3): 436-442.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	25	NA	NR	ug/L	LAB	1997. Zou, E.. Effects of Sublethal Exposure to Zinc Chloride on the Reproduction of the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.58(3): 437-441.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	13	NR	NR	ug/L	LAB	2009. Cooper, N.L., J.R. Bidwell, and A. Kumar. Toxicity of Copper, Lead, and Zinc Mixtures to Ceriodaphnia dubia and Daphnia carinata. Ecotoxicol. Environ. Saf.72: 1523-1528.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1700	NR	NR	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1700	NR	NR	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1700	NR	NR	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1700	NR	NR	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1700	NR	NR	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	1700	NR	NR	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	12.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	162.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	187.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	37.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	87.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEC	Not Reported	T	87.5	NA	NR	ug/L	LAB	1988. Paulaskis, J.D., and R.W. Winner. Effects of Water Hardness and Humic Acid on Zinc Toxicity to Daphnia magna. Toxicology12: 273-290.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Juvenile	T	200000		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., M. Canli, V. Van Lierde, I. Forrez, F. Vanhaecke, and C.R. Janssen. Reproductive Toxicity of Dietary Zinc to Daphnia magna. Aquat. Toxicol.70(3): 233-244.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	D	1000		NC	ug/L	LAB	2002. Muyssen, B.T.A., C.R. Janssen, and B.T.A. Bossuyt. Tolerance and Acclimation to Zinc of Field-Collected Daphnia magna Populations. Aquat. Toxicol.56(2): 69-79.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	D	1000		NC	ug/L	LAB	2002. Muyssen, B.T.A., C.R. Janssen, and B.T.A. Bossuyt. Tolerance and Acclimation to Zinc of Field-Collected Daphnia magna Populations. Aquat. Toxicol.56(2): 69-79.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	1000		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	2500		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	400		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	750		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	750		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	250		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	250		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	350		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	D	300		NC	ug/L	LAB	2001. Muyssen, B.T.A., and C.R. Janssen. Multigeneration Zinc Acclimation and Tolerance in Daphnia magna: Implications for Water-Quality Guidelines and Ecological Risk Assessment. Environ. Toxicol. Chem.20(9): 2053-2060.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Not Reported	T	350		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NOEL	Progeny	T	1700		NC	ug/L	LAB	2008. Bianchini, A., and C.M. Wood. Does Sulfide or Water Hardness Protect Against Chronic Silver Toxicity in Daphnia magna? A Critial Assessment of the Acute-to-Chronic Toxicity Ratio for Silver. Ecotoxicol. Environ. Saf.71: 32-40.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	50	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1990. Belanger, S.E., and D.S. Cherry. Interacting Effects of pH Acclimation, pH, and Heavy Metals on Acute and Chronic Toxicity to Ceriodaphnia dubia (Cladocera). J. Crustac. Biol.10(2): 225-235.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..
Zinc	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	150	NA	NR	ug/L	LAB	1991. Munzinger, A., and F. Monicelli. A Comparison of the Sensitivity of Three Daphnia magna Populations Under Chronic Heavy Metal Stress. Ecotoxicol. Environ. Saf.22: 24-31.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	110		NC	ug/L	LAB	2005. Mahar, A.M., and M.C. Watzin. Effects of Metal and Organophosphate Mixtures on Ceriodaphnia dubia Survival and Reproduction. Environ. Toxicol. Chem.24(7): 1579-1586.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	122		NC	ug/L	LAB	2005. Mahar, A.M., and M.C. Watzin. Effects of Metal and Organophosphate Mixtures on Ceriodaphnia dubia Survival and Reproduction. Environ. Toxicol. Chem.24(7): 1579-1586.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	D	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Evaluation of Site-Specific Criteria for Copper and Zinc: An Integration of Metal Addition Toxicity, Effluent and Receiving Water Toxicity, and Ecological Survey Data. EPA-600/3-86-026, U.S.EPA, Duluth, MN: 68 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Van Dam, R.A., M.J. Barry, J.T. Ahokas, and D.A. Holdway. Investigating Mechanisms of Diethylenetriamine Pentaacetic Acid Toxicity to the Cladoceran, Daphnia carinata. Aquat. Toxicol.46(3): 191-210.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1980. Chapman, G.A., S. Ota, and F. Recht. Effects of Water Hardness on the Toxicity of Metals to Daphnia magna. U.S.EPA, Corvallis, OR: 17 p..
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	140.3	NA	NR	ug/L	LAB	1986. Biesinger, K.E., G.M. Christensen, and J.T. Fiandt. Effects of Metal Salt Mixtures on Daphnia magna Reproduction. Ecotoxicol. Environ. Saf.11(1): 9-14.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	74	NA	NR	ug/L	LAB	1986. Biesinger, K.E., G.M. Christensen, and J.T. Fiandt. Effects of Metal Salt Mixtures on Daphnia magna Reproduction. Ecotoxicol. Environ. Saf.11(1): 9-14.
Zinc chloride (ZnCl2)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Zou, E.. Effects of Sublethal Exposure to Zinc Chloride on the Reproduction of the Water Flea, Moina irrasa (Cladocera). Bull. Environ. Contam. Toxicol.58(3): 437-441.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR		T	300	NA	NR	ug/L	LAB	1981. Winner, R.W.. A Comparison of Body Length, Brood Size and Longevity as Indices of Chronic Copper and Zinc Stresses in Daphnia magna. Environ. Pollut. A.26: 33-37.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.
Sulfuric acid, Zinc salt (1:1)	Water Flea	Crustaceans	Fresh	Reproduction	NR	Not Reported	T	50	NR	NR	ug/L	LAB	1985. Pommery, J., M. Imbenotte, and F. Erb. Relation Entre Toxicite et Formes Libres de Quelques Metaux Traces. Environ. Pollut. Ser. B Chem. Phys.9: 127-136.
Zinc chloride (ZnCl2)	Water Mite	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1992. Timmermans, K.R., E. Spijkerman, M. Tonkes, and H. Govers. Cadmium and Zinc Uptake by Two Species of Aquatic Invertebrate Predators from Dietary and Aqueous Sources. Can. J. Fish. Aquat. Sci.49(4): 655-662.
Zinc chloride (ZnCl2)	Water Scorpion	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2853	NA	NR	ug/L	LAB	1983. Shukla, G.S., R. Murti, and Omkar. Cadmium and Zinc Toxicity to an Aquatic Insect, Ranatra elongata (Fabr.). Toxicol. Lett.15(1): 39-41.
Zinc chloride (ZnCl2)	Water Scorpion	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	2456	NA	NR	ug/L	LAB	1983. Shukla, G.S., R. Murti, and Omkar. Cadmium and Zinc Toxicity to an Aquatic Insect, Ranatra elongata (Fabr.). Toxicol. Lett.15(1): 39-41.
Zinc chloride (ZnCl2)	Water Scorpion	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1943	NA	NR	ug/L	LAB	1983. Shukla, G.S., R. Murti, and Omkar. Cadmium and Zinc Toxicity to an Aquatic Insect, Ranatra elongata (Fabr.). Toxicol. Lett.15(1): 39-41.
Zinc chloride (ZnCl2)	Water Scorpion	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	1658	NA	NR	ug/L	LAB	1983. Shukla, G.S., R. Murti, and Omkar. Cadmium and Zinc Toxicity to an Aquatic Insect, Ranatra elongata (Fabr.). Toxicol. Lett.15(1): 39-41.
Sulfuric acid, Zinc salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	468*	NA	NR	ug/L	LAB	1977. Thibault, D.H., and J.E. Guthrie. Mosquito Larvae: Test Organisms for Screening Liquid Effluents for Their Potential Toxicity. Manit. Entomol.11: 61-68.
Sulfuric acid, Zinc salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Thibault, D.H., and J.E. Guthrie. Mosquito Larvae: Test Organisms for Screening Liquid Effluents for Their Potential Toxicity. Manit. Entomol.11: 61-68.
Sulfuric acid, Zinc salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.
Sulfuric acid, Zinc salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.
Sulfuric acid, Zinc salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.
Sulfuric acid, Zinc salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.
Sulfuric acid, Zinc salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.

Table B-29. Summary of Results from the EcoTox Database for Invertebrates - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Yellow Fever Mosquito	Insects/Spiders	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1985. Abbasi, S.A., P.C. Nipaney, and R. Soni. Environmental Consequences of the Inhibition in the Hatching of Pupae of Aedes aegypti by Mercury, Zinc and Chromium-the Abnormal Toxicity of Zinc. Int. J. Environ. Stud.24(2): 107-114.
Zinc chloride (ZnCl2)	Zebra Mussel	Molluscs	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Kraak, M.H.S., Y.A. Wink, S.C. Stuijfzand, M.C. Buckert-De Jong, C.J. De Groot, and W. Admiraal. Chronic Ecotoxicity of Zn and Pb to the Zebra Mussel Dreissena polymorpha. Aquat. Toxicol.30(1): 77-89.
Zinc chloride (ZnCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	4293	NA	NR	ug/L	LAB	1994. Kraak, M.H.S., Y.A. Wink, S.C. Stuijfzand, M.C. Buckert-De Jong, C.J. De Groot, and W. Admiraal. Chronic Ecotoxicity of Zn and Pb to the Zebra Mussel Dreissena polymorpha. Aquat. Toxicol.30(1): 77-89.
Zinc chloride (ZnCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	LC50	Not Reported	T	1065	NA	NR	ug/L	LAB	1994. Kraak, M.H.S., Y.A. Wink, S.C. Stuijfzand, M.C. Buckert-De Jong, C.J. De Groot, and W. Admiraal. Chronic Ecotoxicity of Zn and Pb to the Zebra Mussel Dreissena polymorpha. Aquat. Toxicol.30(1): 77-89.
Zinc chloride (ZnCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	2739	NA	NR	ug/L	LAB	1994. Kraak, M.H.S., Y.A. Wink, S.C. Stuijfzand, M.C. Buckert-De Jong, C.J. De Groot, and W. Admiraal. Chronic Ecotoxicity of Zn and Pb to the Zebra Mussel Dreissena polymorpha. Aquat. Toxicol.30(1): 77-89.
Zinc chloride (ZnCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR	Not Reported	T	101	NA	NR	ug/L	LAB	1994. Kraak, M.H.S., Y.A. Wink, S.C. Stuijfzand, M.C. Buckert-De Jong, C.J. De Groot, and W. Admiraal. Chronic Ecotoxicity of Zn and Pb to the Zebra Mussel Dreissena polymorpha. Aquat. Toxicol.30(1): 77-89.
Zinc chloride (ZnCl2)	Zebra Mussel	Molluscs	Fresh	Mortality	NR-LETH	Not Reported	T	15.3		NC	uM	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

ARCADIS

Table 30. Acronyms for Summary of Results from the EcoTox Database for Invertebrates

% g = percent grams
% v/v = percent volume per volume
* = denotes value is the dilution water chemistry (aquatic), denotes value is from the pretreatment media (soil)
A = analytical grade
AI = active ingredient
AM = analytical grade, measured
AN = analytical grade, nominal
Bq = becquerels
cc = cocoons
d = day
D = dissolved
ECXX = effective concentration to XX% of test organisms
EDXX = effective dose to XX% of test organisms
ERXX = effective residue concentration to XX% of test organisms
F = formulation
fd = food
FIELDA = undefined
FIELDN = undefined
FIELDU = undefined
g = gram
h = hour
I = inorganic monomeric
ICXX = inhibition concentration to XX% of test organisms
kg = kilograms
L = liter
LAB = laboratory
lb = pounds
LCXX = lethal concentration to XX% of test organisms
LDXX = lethal dose to XX% of test organisms
LETC = lethal threshold concentration
LOEC = lowest observable effect concentration
LOEL = lowest observable effect level
LRXX = lethal residue concentration to XX% of test organisms
M = molar
m2 = square meter
MATC = maximum acceptable toxicant concentration
mg = milligram
ml = milliliter
mM = millimolar
mmol = millimole
mol/L = moles per liter
molal = molality
N = normal
NA = not applicable
NC = not coded
NE = no effect
ng = nanogram
nM = nanomolar
nmol = nanomoles
NOEC = no observable effect concentration
NOEL = no observable effect level
NOER = no observable effect residue
NR = not reported
NR-LETH = 100% mortality or 0% survival of test organisms
NR-ZERO = 0% mortality or 100% survival of test organisms
org = organism
Pop growth = population growth
SE = significant effect
T = total
uCI = microcuries
ug = micrograms
uM = micromolar
umol = micromoles

Table B-31. Effects Based Tissue Concentrations for Invertebrates - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	0.59	ED20	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	37.18	ED20	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	0.84	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	4.53	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	41.8	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	0.61	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	24.81	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	41.49	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	49.87	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	20.7	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	50.84	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	126.2	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	25.08	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	71.15	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	142.6	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	20.94	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	18.48	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	109.77	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	1	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	42.92	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	52.74	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	96.74	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	7.6	ED50	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	8.8	ED50	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	8.8	ED50	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	15.2	ED50	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	17.2	ED50	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	19.2	ED50	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	29.6	ED50	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	29.6	ED50	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	38	ED50	Ingestion	Whole Body	1991. Borgmann, U., Norwood, W.P., and I.M. Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	44	ED50	Ingestion	Whole Body	1991. Borgmann, U., Norwood, W.P., and I.M. Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	44	ED50	Ingestion	Whole Body	1991. Borgmann, U., Norwood, W.P., and I.M. Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	79	ED50	Ingestion	Whole Body	1991. Borgmann, U., Norwood, W.P., and I.M. Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	86	ED50	Ingestion	Whole Body	1991. Borgmann, U., Norwood, W.P., and I.M. Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	98	ED50	Ingestion	Whole Body	1991. Borgmann, U., Norwood, W.P., and I.M. Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	30.35	LD25	Water	Whole body	2001. Borgmann U, WP Norwood, TB Reynoldson, and F Rosa. Can J Fish Aquat Sci 58:950-960
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	6	LOED	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	7.8	LOED	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	7.8	LOED	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	15.2	LOED	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	17.4	LOED	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	4.6	NOED	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	4.6	NOED	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	6.4	NOED	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	8.4	NOED	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	9.4	NOED	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Embryo	Mortality	12.4	NOED	Water	Whole Body	1991. Borgmann U, WP Norwood, IM Babirad. Can J Fish Aquat Sci 48:1055-1060
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	109.77	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	18.48	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	0.59	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	0.84	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	4.53	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	37.18	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	41.8	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	0.61	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	1	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	24.81	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	41.49	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	49.87	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	20.7	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	42.92	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	50.84	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	126.2	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	126.2	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908

Table B-31. Effects Based Tissue Concentrations for Invertebrates - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	25.08	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	52.74	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	71.15	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	142.6	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	20.94	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	20.94	NOED	Water	Whole Body	2005. Stanley, JK; BW Brooks; TW LaPoint. Environ Tox & Chem 24:902-908
Cladoceran	Invertebrate	Fresh	Larval	Growth	20	LOED	Ingestion	Whole Body	1981. Hatakeyama, S. and M. Yasuno. Ecotoxicol Environ Saf 05:341-350
Cladoceran	Invertebrate	Fresh		Growth	450	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Cladoceran	Invertebrate	Fresh		Growth	8.6	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Cladoceran	Invertebrate	Fresh		Growth	225	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Cladoceran	Invertebrate	Fresh	Other	Mortality	0.708	LOED	Ingestion	Whole Body	1981. Hatakeyama S, M Yasuno. Ecotoxicol Environ Saf 05:341-380
Cladoceran	Invertebrate	Fresh	Larval	Mortality	20	LOED	Ingestion	Whole Body	1981. Hatakeyama, S. and M. Yasuno. Ecotoxicol Environ Saf 05:341-350
Cladoceran	Invertebrate	Fresh	Population	Mortality	3.5	LOED	Absorption	Whole Body	1978. Marshall, J.S.. J Fish Res Bd Can 35:461-469.
Cladoceran	Invertebrate	Fresh	Population	Mortality	8.6	LOED	Absorption	Whole Body	1978. Marshall, J.S.. J Fish Res Bd Can 35:461-469.
Cladoceran	Invertebrate	Fresh	Other	Mortality	0.5	NOED	Ingestion	Whole Body	1981. Hatakeyama S, M Yasuno. Ecotoxicol Environ Saf 05:341-380
Cladoceran	Invertebrate	Fresh	Larval	Mortality	10	NOED	Ingestion	Whole Body	1981. Hatakeyama, S. and M. Yasuno. Ecotoxicol Environ Saf 05:341-350
Cladoceran	Invertebrate	Fresh	Population	Mortality	5.7	NOED	Absorption	Whole Body	1978. Marshall, J.S.. J Fish Res Bd Can 35:461-469.
Cladoceran	Invertebrate	Fresh	Larval	Reproduction	20	ED100	Ingestion	Whole Body	1981. Hatakeyama, S. and M. Yasuno. Ecotoxicol Environ Saf 05:341-350
Cladoceran	Invertebrate	Fresh	Other	Reproduction	20	ED16	Ingestion	Whole Body	1981. Hatakeyama S, M Yasuno. Ecotoxicol Environ Saf 05:341-380
Cladoceran	Invertebrate	Fresh	Other	Reproduction	8.4	ED22	Ingestion	Whole Body	1981. Hatakeyama S, M Yasuno. Ecotoxicol Environ Saf 05:341-380
Cladoceran	Invertebrate	Fresh	Other	Reproduction	6	ED36	Ingestion	Whole Body	1981. Hatakeyama S, M Yasuno. Ecotoxicol Environ Saf 05:341-380
Cladoceran	Invertebrate	Fresh	Other	Reproduction	9.4	ED64	Ingestion	Whole Body	1981. Hatakeyama S, M Yasuno. Ecotoxicol Environ Saf 05:341-380
Cladoceran	Invertebrate	Fresh	Larval	Reproduction	10	LOED	Ingestion	Whole Body	1981. Hatakeyama, S. and M. Yasuno. Ecotoxicol Environ Saf 05:341-350
Cladoceran	Invertebrate	Fresh		Reproduction	450	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Cladoceran	Invertebrate	Fresh		Reproduction	3.5	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Cladoceran	Invertebrate	Fresh		Reproduction	3.5	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Cladoceran	Invertebrate	Fresh		Reproduction	3.5	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Cladoceran	Invertebrate	Fresh	Larval	Reproduction	8	NOED	Ingestion	Whole Body	1981. Hatakeyama, S. and M. Yasuno. Ecotoxicol Environ Saf 05:341-350
Cladoceran	Invertebrate	Fresh		Reproduction	225	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Clam - Asiatic	Invertebrate	Fresh	Adult	Mortality	4	LD100	Combined	Soft Tissue	2006. Marie V, M Baudrimont, A Boudou. Chemosphere 65:609-617
Clam - Asiatic	Invertebrate	Fresh	NS	Mortality	20	NOED	Water	Whole Body	2001. Barfield, M.L., J.L. Farris, M.C. Black. J Toxicol Environ Health, Part A 63:495-510
Crayfish	Invertebrate	Fresh	Adult	Growth	22	NOED	Combined	Whole Body	1979. Thorp, J.H., Giesy, J.P., Wineriter, S.A.. Arch Environ Contam Toxicol 08:449-456
Crayfish	Invertebrate	Fresh		Growth	22	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Crayfish	Invertebrate	Fresh	Adult	Mortality	16.94	LD100	Water	Whole Body	1986. Mirenda RJ. Arch Environ Contam Toxicol 15:401-407
Crayfish	Invertebrate	Fresh	Adult	Mortality	18.74	LD100	Water	Whole Body	1986. Mirenda RJ. Arch Environ Contam Toxicol 15:401-407
Crayfish	Invertebrate	Fresh	Adult	Mortality	28.46	LD100	Water	Whole Body	1986. Mirenda RJ. Arch Environ Contam Toxicol 15:401-407
Crayfish	Invertebrate	Fresh	Adult	Mortality	4.82	LD25	Water	Whole Body	1986. Mirenda RJ. Arch Environ Contam Toxicol 15:401-407
Crayfish	Invertebrate	Fresh	Adult	Mortality	10.32	LD74	Water	Whole Body	1986. Mirenda RJ. Arch Environ Contam Toxicol 15:401-407
Crayfish	Invertebrate	Fresh	Adult	Mortality	22	LOED	Combined	Whole Body	1979. Thorp, J.H., Giesy, J.P., Wineriter, S.A.. Arch Environ Contam Toxicol 08:449-456
Crayfish	Invertebrate	Fresh	Adult	Mortality	35.4	NOED	Water	Gill	1982. Dickson GW, JP Giesy, LA Briese. Environ Tox & Chem 01:147-156
Crayfish	Invertebrate	Fresh	Adult	Mortality	14.9	NOED	Combined	Whole Body	1979. Thorp, J.H., Giesy, J.P., Wineriter, S.A.. Arch Environ Contam Toxicol 08:449-456
Crayfish	Invertebrate	Fresh	NA	Mortality	534	NOED	Absorption	Whole Body	1977. Gillespie, R., T. Reisine and E.J. Massaro. Environ Res 13:364-36.
Crayfish	Invertebrate	Fresh	NS	Survival	540	NOED	Water	Whole Body	1977. Gillespie R, T Reisine, EJ Massaro. Environ Res 13:364-368
Midge	Invertebrate	Fresh	Adult	Growth	236.1	ED43	Combined	Whole Body	2002. Gillis, P.L., L.C. Diener, T.B. Reynoldson, D.G.Dixon. Environ Tox & Chem 21(9):1836-1844
Midge	Invertebrate	Fresh	Larval	Growth	80	ED45	Water	Whole Body	1992. Timmermans KR, W Peeters, and M. Tonkes. Hydrobiologia 241:119-134.
Midge	Invertebrate	Fresh	Larval	Growth	30	LOED	Water	Whole Body	1990. Heinis, F., K.R. Timmermans, W.R. Swain.. Aquat Toxicol 16:73-86
Midge	Invertebrate	Fresh	Larval	Growth	50	LOED	Water	Whole Body	1990. Heinis, F., K.R. Timmermans, W.R. Swain.. Aquat Toxicol 16:73-86
Midge	Invertebrate	Fresh	Larval	Growth	26	LOED	Absorption	Whole Body	1990. Heinis, F., Timmermans, K.R., and W.R. Swain. Aquat Toxicol 16:73-86.
Midge	Invertebrate	Fresh	Larval	Growth	30	NOED	Water	Whole Body	1990. Heinis, F., K.R. Timmermans, W.R. Swain.. Aquat Toxicol 16:73-86
Midge	Invertebrate	Fresh	Larval	Growth	7.6	NOED	Absorption	Whole Body	1994. Postma, J.F., M.C. Buckert-de Jong, N. Staats, and C. Davids. Arch Environ Contam Toxicol 26:143-148
Midge	Invertebrate	Fresh	Larval	Growth	20	NOED	Absorption	Whole Body	1990. Heinis, F., Timmermans, K.R., and W.R. Swain. Aquat Toxicol 16:73-86.
Midge	Invertebrate	Fresh	Larval	Mortality	2.6	LD100	Water	Whole Body	1995. Postma J, C Davids. Ecotoxicol Environ Saf 30:195-201
Midge	Invertebrate	Fresh	Larval	Mortality	27.4	LD51	Water	Whole Body	1992. Timmermans KR, W Peeters, and M. Tonkes. Hydrobiologia 241:119-134.
Midge	Invertebrate	Fresh	Larval	Mortality	4.8	LD60	Water	Whole Body	1995. Postma J, C Davids. Ecotoxicol Environ Saf 30:195-201
Midge	Invertebrate	Fresh	Larval	Mortality	9.8	LD60	Water	Whole Body	1995. Postma J, C Davids. Ecotoxicol Environ Saf 30:195-201
Midge	Invertebrate	Fresh	Larval	Mortality	46.8	LD68	Water	Whole Body	1992. Timmermans KR, W Peeters, and M. Tonkes. Hydrobiologia 241:119-134.
Midge	Invertebrate	Fresh	Larval	Mortality	138	LOED	Water	Whole Body	1990. Heinis, F., K.R. Timmermans, W.R. Swain.. Aquat Toxicol 16:73-86
Midge	Invertebrate	Fresh	Larval	Mortality	7.6	LOED	Absorption	Whole Body	1994. Postma, J.F., M.C. Buckert-de Jong, N. Staats, and C. Davids. Arch Environ Contam Toxicol 26:143-148
Midge	Invertebrate	Fresh	Larval	Mortality	74	NOED	Water	Whole Body	1990. Heinis, F., K.R. Timmermans, W.R. Swain.. Aquat Toxicol 16:73-86
Midge	Invertebrate	Fresh	Larval	Mortality	5.6	NOED	Absorption	Whole Body	1994. Postma, J.F., M.C. Buckert-de Jong, N. Staats, and C. Davids. Arch Environ Contam Toxicol 26:143-148
Midge	Invertebrate	Fresh	Larval	Mortality	140	NOED	Absorption	Whole Body	1990. Heinis, F., Timmermans, K.R., and W.R. Swain. Aquat Toxicol 16:73-86.
Midge	Invertebrate	Fresh	Adult	Mortality	236.1	NOED	Combined	Whole Body	2002. Gillis, P.L., L.C. Diener, T.B. Reynoldson, D.G.Dixon. Environ Tox & Chem 21(9):1836-1844
Midge	Invertebrate	Fresh	Larval	Reproduction	7.6	NOED	Absorption	Whole Body	1994. Postma, J.F., M.C. Buckert-de Jong, N. Staats, and C. Davids. Arch Environ Contam Toxicol 26:143-148
Net-spinning Caddisfly	Invertebrate	Fresh	Larval	Growth	15.6	NOED	Water	Whole Body	2001. Illes, J., R.D. Evans, G.C. Balch. Bull Environ Contam Toxicol 66:484-491
Net-spinning Caddisfly	Invertebrate	Fresh	Larval	Growth	12.4	NOED	Water	Whole Body	2001. Illes, J., R.D. Evans, G.C. Balch. Bull Environ Contam Toxicol 66:484-491
Northern Leopard Frog	Invertebrate	Fresh	Larval	Mortality	1.2	LD07	Water	Whole Body	2007. Gross J, T-H Chen, WH Karasov. Environmental Toxicology and Chemistry 26:1192-1197

Table B-31. Effects Based Tissue Concentrations for Invertebrates - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Northern Leopard Frog	Invertebrate	Fresh	Larval	Mortality	1.2	LD07	Water	Whole Body	2007. Gross J, T-H Chen, WH Karasov. Environmental Toxicology and Chemistry 26:1192-1197
Northern Leopard Frog	Invertebrate	Fresh	Larval	Mortality	1.2	LD07	Water	Whole Body	2007. Gross J, T-H Chen, WH Karasov. Environmental Toxicology and Chemistry 26:1192-1197
Northern Leopard Frog	Invertebrate	Fresh	Larval	Mortality	13.3	LD42	Water	Whole Body	2007. Gross J, T-H Chen, WH Karasov. Environmental Toxicology and Chemistry 26:1192-1197
Northern Leopard Frog	Invertebrate	Fresh	Larval	Mortality	13.3	LD61	Water	Whole Body	2007. Gross J, T-H Chen, WH Karasov. Environmental Toxicology and Chemistry 26:1192-1197
Water flea	Invertebrate	Fresh	Juvenile	Growth	7.38	ED13	Water	Whole Body	2006. Guan R, WX Wang. Environ Pollut 141:343-352
Water flea	Invertebrate	Fresh	Juvenile	Growth	10.2	ED28	Water	Whole Body	2006. Guan R, WX Wang. Environ Pollut 141:343-352
Water flea	Invertebrate	Fresh	Juvenile	Growth	17.3	ED37	Water	Whole Body	2006. Guan R, WX Wang. Environ Pollut 141:343-352
Water flea	Invertebrate	Fresh	Juvenile	Growth	9.98	ED39	Water	Whole Body	2006. Guan R, WX Wang. Environ Pollut 141:343-352
Water flea	Invertebrate	Fresh	Juvenile	Growth	13.28	ED46	Water	Whole Body	2006. Guan R, WX Wang. Environ Pollut 141:343-352
Water flea	Invertebrate	Fresh	Neonate	Mortality	8.4	LD100	Water	Whole Body	2003. Heugens EHW, T Jager, R Creyghton, MHS Kraak, AJ Hendriks, NM Van Straalen, and W Admiraal. Environ
Water flea	Invertebrate	Fresh	Neonate	Mortality	11	LD16	Water	Whole Body	2003. Heugens EHW, T Jager, R Creyghton, MHS Kraak, AJ Hendriks, NM Van Straalen, and W Admiraal. Environ
Water flea	Invertebrate	Fresh	Juvenile	Mortality	6	LD50	Water	Whole Body	2002. Barata C; SJ Markich; DJ Baird; AMVM Soares. Aquat Toxicol 61:143-154
Water flea	Invertebrate	Fresh	Juvenile	Mortality	8	LD50	Water	Whole Body	2002. Barata C; SJ Markich; DJ Baird; AMVM Soares. Aquat Toxicol 61:143-154
Water flea	Invertebrate	Fresh	Juvenile	Mortality	11.8	LD50	Water	Whole Body	2002. Barata C; SJ Markich; DJ Baird; AMVM Soares. Aquat Toxicol 61:143-154
Water flea	Invertebrate	Fresh	Juvenile	Mortality	9.6	LD50	Combined	Whole Body	2002. Barata C; SJ Markich; DJ Baird; AMVM Soares. Aquat Toxicol 61:143-154
Water flea	Invertebrate	Fresh	Juvenile	Mortality	13.6	LD50	Combined	Whole Body	2002. Barata C; SJ Markich; DJ Baird; AMVM Soares. Aquat Toxicol 61:143-154
Water flea	Invertebrate	Fresh	Juvenile	Mortality	12.2	LD50	Combined	Whole Body	2002. Barata C; SJ Markich; DJ Baird; AMVM Soares. Aquat Toxicol 61:143-154
Water flea	Invertebrate	Fresh	NA	Mortality	8.8	LD73	Ingestion	Whole Body	1983. Ferard JF, JM Jouany, R Truhaut, P Vasseur. Ecotoxicol Environ Saf 07:43-52
Water flea	Invertebrate	Fresh	NA	Mortality	11.6	LD80	Ingestion	Whole Body	1983. Ferard JF, JM Jouany, R Truhaut, P Vasseur. Ecotoxicol Environ Saf 07:43-52
Water flea	Invertebrate	Fresh	NA	Mortality	51.8	LD83	Ingestion	Whole Body	1983. Ferard JF, JM Jouany, R Truhaut, P Vasseur. Ecotoxicol Environ Saf 07:43-52
Water flea	Invertebrate	Fresh	Neonate	Mortality	4	NOED	Water	Whole Body	2003. Heugens EHW, T Jager, R Creyghton, MHS Kraak, AJ Hendriks, NM Van Straalen, and W Admiraal. Environ
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.46	ED100	Water	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.84	ED100	Water	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	2.2	ED100	Water	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.7	ED100	Absorption	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.4	ED23	Water	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.26	ED24	Absorption	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.16	ED46	Ingestion	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.52	ED48	Absorption	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.13	ED83	Ingestion	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.44	ED87	Water	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.56	ED87	Absorption	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.052	ED96	Ingestion	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477
Water fleas	Invertebrate	Fresh	Adult	Reproduction	0.026	NOED	Ingestion	Whole Body	2007. Sofyan A, G Rosita, DJ Price, WJ Birge. Environ Toxicol & Chem 26(3):470-477

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Table B-32. Effects Based Tissue Concentrations for Invertebrates - Cobalt

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	12.98	LD25	Water	Whole body	2001. Borgmann U, WP Norwood, TB Reynoldson, and F Rosa. Can J Fish Aquat Sci 58:950-960
Amphipod - Freshwater	Invertebrate	Fresh	NS	Mortality	1.061	LD25	NS		2007. Norwood WO, U Borgmann, DG Dixon. Environ Pollut 147;262-272
Amphipod - Freshwater	Invertebrate	Fresh	NS	Mortality	2.263	LD50	NS		2007. Norwood WO, U Borgmann, DG Dixon. Environ Pollut 147;262-272

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Table B-33. Effects Based Tissue Concentrations for Invertebrates - Iron

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Mussel	Invertebrate	Fresh	Adult	Growth	68	NOED	Combined	Whole Body	2003. St-Jean SD, SC Courtenay, RW Parker. Water Qual Res J Can 38(4):647-666
Mussel	Invertebrate	Fresh	Adult	Mortality	68	NOED	Combined	Whole Body	2003. St-Jean SD, SC Courtenay, RW Parker. Water Qual Res J Can 38(4):647-666

Table B-34. Effects Based Tissue Concentrations for Invertebrates - Lead

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Amphipod	Invertebrate	Fresh	Adult	Mortality	40	LD61	Water	Whole Body	1978. Spehar RL, RL Anderson, JT Fiandt. Environ Pollut 15:195-208
Amphipod	Invertebrate	Fresh	Adult	Mortality	102	LD61	Water	Whole Body	1978. Spehar RL, RL Anderson, JT Fiandt. Environ Pollut 15:195-208
Amphipod	Invertebrate	Fresh	Immature	Mortality	4	NOED	Combined	Whole Body	1984. Sundelin, B.. Ecotoxicological Testing for the Marine Environment, Vol. 2, 588 P, 1984
Amphipod	Invertebrate	Fresh	Adult	Mortality	4	NOED	Combined	Whole Body	1984. Sundelin, B.. Ecotoxicological Testing for the Marine Environment, Vol. 2, 588 P, 1984
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	26.107	LD25	Water	Whole body	2001. Borgmann U, WP Norwood, TB Reynoldson, and F Rosa. Can J Fish Aquat Sci 58:950-960
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	5.22	LD25	Absorption	Whole Body	1999. Borgmann U, WP Norwood. Can J Fish Aquat Sci 56:1494-1503
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	70	LD50	Absorption	Whole Body	1993. Maclean, R.S., U. Borgmann and D.G. Dixon. Poster P418, 14th Annual Meeting, SETAC Houston
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	90	LD50	Absorption	Whole Body	1993. Maclean, R.S., U. Borgmann and D.G. Dixon. Poster P418, 14th Annual Meeting, SETAC Houston
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	115	LD50	Absorption	Whole Body	1993. Maclean, R.S., U. Borgmann and D.G. Dixon. Poster P418, 14th Annual Meeting, SETAC Houston
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	160	LD50	Absorption	Whole Body	1993. Maclean, R.S., U. Borgmann and D.G. Dixon. Poster P418, 14th Annual Meeting, SETAC Houston
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	72.31	LD50	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	150.84	LD50	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	89.92	LD50	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	101.53	LD50	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	6.71	LD50	Absorption	Whole Body	1999. Borgmann U, WP Norwood. Can J Fish Aquat Sci 56:1494-1503
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Survival	82.67	LOED	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Survival	130.328	LOED	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Survival	68.376	LOED	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Survival	85.78	LOED	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Survival	48.277	NOED	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Survival	82.88	NOED	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Survival	44.755	NOED	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Survival	58.844	NOED	Water	Whole Body	1996. MacLean RS, U Borgmann, and DG Dixon. Can J Fish Aquat Sci 53:2212-2220
Biomphalaria glabrata	Invertebrate	Fresh	Adult	Mortality	5	NOED	Water	Whole Body	2005. Aisemberg J; DE Nahabedian; EA Wider; NRV Guerrero. Toxicology 210:45-53
Biomphalaria glabrata	Invertebrate	Fresh	Adult	Mortality	20	NOED	Water	Whole Body	2005. Aisemberg J; DE Nahabedian; EA Wider; NRV Guerrero. Toxicology 210:45-53
Biomphalaria glabrata	Invertebrate	Fresh	Adult	Mortality	32	NOED	Water	Whole Body	2005. Aisemberg J; DE Nahabedian; EA Wider; NRV Guerrero. Toxicology 210:45-53
Biomphalaria glabrata	Invertebrate	Fresh	Adult	Mortality	40	NOED	Water	Whole Body	2005. Aisemberg J; DE Nahabedian; EA Wider; NRV Guerrero. Toxicology 210:45-53
Biomphalaria glabrata	Invertebrate	Fresh	Adult	Mortality	85	NOED	Water	Whole Body	2005. Aisemberg J; DE Nahabedian; EA Wider; NRV Guerrero. Toxicology 210:45-53

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Table B-35. Effects Based Tissue Concentrations for Invertebrates - Manganese

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Amphipod - Freshwater	Invertebrate	Fresh	NS	Mortality	487.848	LD25	NS		2007. Norwood WO, U Borgmann, DG Dixon. Environ Pollut 147;262-272
Amphipod - Freshwater	Invertebrate	Fresh	NS	Mortality	53.619	LD25	NS		2007. Norwood WO, U Borgmann, DG Dixon. Environ Pollut 147;262-272
Amphipod - Freshwater	Invertebrate	Fresh	NS	Mortality	180.187	LD50	NS		2007. Norwood WO, U Borgmann, DG Dixon. Environ Pollut 147;262-272
Amphipod - Freshwater	Invertebrate	Fresh	NS	Mortality	620.798	LD50	NS		2007. Norwood WO, U Borgmann, DG Dixon. Environ Pollut 147;262-272

Table B-36. Effects Based Tissue Concentrations for Invertebrates - Mercury

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Mayflly	Invertebrate	Fresh	Nymph	Growth	0.175	ED141	Absorption	Whole Body	2000. Naimo TJ, JF Wiener, WG Cope, NS Bloom. Can J Fish Aquat Sci 57:1092-1102
Mayflly	Invertebrate	Fresh	Nymph	Growth	0.0246	ED168	Absorption	Whole Body	2000. Naimo TJ, JF Wiener, WG Cope, NS Bloom. Can J Fish Aquat Sci 57:1092-1102
Mayflly	Invertebrate	Fresh	Nymph	Growth	0.152	ED174	Absorption	Whole Body	2000. Naimo TJ, JF Wiener, WG Cope, NS Bloom. Can J Fish Aquat Sci 57:1092-1102
Mayflly	Invertebrate	Fresh	Nymph	Growth	0.0298	ED177	Absorption	Whole Body	2000. Naimo TJ, JF Wiener, WG Cope, NS Bloom. Can J Fish Aquat Sci 57:1092-1102
Mayflly	Invertebrate	Fresh	Nymph	Growth	0.152	ED210	Absorption	Whole Body	2000. Naimo TJ, JF Wiener, WG Cope, NS Bloom. Can J Fish Aquat Sci 57:1092-1102
Mayflly	Invertebrate	Fresh	Nymph	Growth	0.131	ED25	Absorption	Whole Body	2000. Naimo TJ, JF Wiener, WG Cope, NS Bloom. Can J Fish Aquat Sci 57:1092-1102
Mayflly	Invertebrate	Fresh	Nymph	Growth	0.108	ED63	Absorption	Whole Body	2000. Naimo TJ, JF Wiener, WG Cope, NS Bloom. Can J Fish Aquat Sci 57:1092-1102
Mayfly-Burrowing	Invertebrate	Fresh	Nymph	Growth	2	NOED	Combined	Whole Body	1994. Odin, M., Ferutet-Mazel, A., Ribeyre, F. and A. Boudou. Environ Tox & Chem
Mayfly-Burrowing	Invertebrate	Fresh	Nymph	Growth	2.7	NOED	Combined	Whole Body	1994. Odin, M., Ferutet-Mazel, A., Ribeyre, F. and A. Boudou. Environ Tox & Chem
Mayfly-Burrowing	Invertebrate	Fresh	Nymph	Mortality	2	NOED	Combined	Whole Body	1994. Odin, M., Ferutet-Mazel, A., Ribeyre, F. and A. Boudou. Environ Tox & Chem
Mayfly-Burrowing	Invertebrate	Fresh	Nymph	Mortality	2.7	NOED	Combined	Whole Body	1994. Odin, M., Ferutet-Mazel, A., Ribeyre, F. and A. Boudou. Environ Tox & Chem
Midge	Invertebrate	Fresh	Larval	Mortality	40	NOED	Absorption	Whole Body	1986. Rossaro, B., G.F. Gaggino, and R. Marchetti.. Bull Environ Contam Toxicol 37:402-406
Midge	Invertebrate	Fresh	Larval	Mortality	88	NOED	Absorption	Pupal Exuviae	1986. Rossaro, B., G.F. Gaggino, and R. Marchetti.. Bull Environ Contam Toxicol 37:402-406
Midge	Invertebrate	Fresh	Larval	Mortality	107.6	NOED	Absorption	Whole Body	1986. Rossaro, B., G.F. Gaggino, and R. Marchetti.. Bull Environ Contam Toxicol 37:402-406
Water flea	Invertebrate	Fresh	Immature	Mortality	18.4	ED25	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Juvenile	Mortality	18.9	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	16.1	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	9.73	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	16.1	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	13.8	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	23.2	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	16.1	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	15.8	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	10.3	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	16.1	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	20.3	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	20.6	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Juvenile	Mortality	25.9	LD50	Water	Whole Body	2006. Tsui MTK and W-X Wang. Environ Sci Technol 40:4025-4030
Water flea	Invertebrate	Fresh	Immature	Mortality	0.859	NOED	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Immature	Mortality	1.53	NOED	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Immature	Mortality	1.64	NOED	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Immature	Mortality	2.33	NOED	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Immature	Mortality	4.67	NOED	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Immature	Mortality	7.57	NOED	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Immature	Reproduction	1.64	ED35	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Immature	Reproduction	4.67	ED62	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Immature	Reproduction	7.57	ED63	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Immature	Reproduction	18.4	ED99	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Immature	Reproduction	2.33	LOED	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh		Reproduction	23.28	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Water flea	Invertebrate	Fresh	Immature	Reproduction	0.859	NOED	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh	Immature	Reproduction	1.53	NOED	Absorption	Whole Body	1982. Biesinger, K.E., L.E. Anderson and J.G. Eaton. Arch Environ Contam Toxicol 11:769-774.
Water flea	Invertebrate	Fresh		Reproduction	15.26	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2

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Table B-37. Effects Based Tissue Concentrations for Invertebrates - Nickel

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Growth	1.678	ED25	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Growth	1.209	ED25	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Growth	1.15	ED25	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Growth	1.537	ED25	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Growth	1.3498	ED25	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	1.678	LD25	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	1.432	LD25	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	2.31	LD25	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	1.103	LD25	Water	Whole body	2001. Borgmann U, WP Norwood, TB Reynoldson, and F Rosa. Can J Fish Aquat Sci 58:950-960
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	2.23	LD50	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	1.948	LD50	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	2.922	LD50	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	3.873	LD50	Combined	Whole Body	2001. Borgmann U, R Neron, WP Norwood. Environ Pollut 111:189-198
Water flea	Invertebrate	Fresh	Juvenile	Growth	9.92	ED08	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Growth	10.8	ED10	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Growth	14.5	ED10	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Mortality	14.5	NOED	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	10.8	ED08	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	14.5	ED08	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	9.92	ED09	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	9.92	ED20	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	10.8	ED25	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	9.92	ED26	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	9.92	ED30	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	10.8	ED30	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	9.92	ED31	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	14.5	ED31	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	10.8	ED33	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	10.8	ED33	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	14.5	ED35	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	14.5	ED36	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	14.5	ED36	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	10.8	ED36	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	9.92	ED38	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	10.8	ED39	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	14.5	ED39	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	14.5	ED43	Ingestion	Whole Body	2009. Evens R, KAC De Schamphelaere, CR Janssen. Aquat Toxicol 94:138-144

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Table B-38 Effects Based Tissue Concentrations for Invertebrates - PCBs

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Amphipod - Freshwater	Invertebrate	Fresh		Mortality	157	LD50			2000. Fay AA; BJ Brownawell; AA Elskus; AE McElroy. Environ Tox & Chem 19:1028-1035
Amphipod - Freshwater	Invertebrate	Fresh		Mortality	29	LD50			2000. Fay AA; BJ Brownawell; AA Elskus; AE McElroy. Environ Tox & Chem 19:1028-1035
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	30	NOED	Absorption	Whole Body	1990. Borgmann, U., N.P. Norwood, and K.M. Ralph. Arch Environ Contam Toxicol 19:558-564
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	54	NOED	Absorption	Whole Body	1990. Borgmann, U., N.P. Norwood, and K.M. Ralph. Arch Environ Contam Toxicol 19:558-564
Crayfish	Invertebrate	Fresh	Mature	Mortality	0.04	NOED	Combined	Whole Body	1972. Sanders, H.O., Chandler, J.H.. Bull Environ Contam Toxicol
Giant Black Stonefly	Invertebrate	Fresh	Immature	Mortality	1.4	NOED	Combined	Whole Body	1972. Sanders, H.O., Chandler, J.H.. Bull Environ Contam Toxicol
Mayfly	Invertebrate	Fresh	Immature	Growth	1.5	NOED	Combined	Whole Body	1973. Sodergren, A., Svensson, B.. Bull Environ Contam Toxicol 09(6)
Mayfly	Invertebrate	Fresh	Juvenile	Mortality	1.4	NOED	Water	Whole Body	1973. Sodergren A, BJ Svensson. Bull Environ Contam Toxicol 09:345-350
Mayfly	Invertebrate	Fresh	Immature	Mortality	1.5	NOED	Combined	Whole Body	1973. Sodergren, A., Svensson, B.. Bull Environ Contam Toxicol 09(6)
Midge	Invertebrate	Fresh	Larval	Growth	38.3	ED13	Ingestion	Whole Body	2001. Hwang, H., S.W. Fisher, P.F. Landrum. Aquat Toxicol 52:251-267
Midge	Invertebrate	Fresh	Larval	Growth	90.2	ED25	Ingestion	Whole Body	2001. Hwang, H., S.W. Fisher, P.F. Landrum. Aquat Toxicol 52:251-267
Midge	Invertebrate	Fresh	Larval	Growth	38.3	NOED	Ingestion	Whole Body	2001. Hwang, H., S.W. Fisher, P.F. Landrum. Aquat Toxicol 52:251-267
Midge	Invertebrate	Fresh	Larval	Growth	90.2	NOED	Ingestion	Whole Body	2001. Hwang, H., S.W. Fisher, P.F. Landrum. Aquat Toxicol 52:251-267
Midge	Invertebrate	Fresh	Larval	Mortality	205.7	LD50	Ingestion	Whole Body	2001. Hwang, H., S.W. Fisher, P.F. Landrum. Aquat Toxicol 52:251-267
Midge	Invertebrate	Fresh	Larval	Mortality	267.05	LD56	Ingestion	Whole Body	2001. Hwang, H., S.W. Fisher, P.F. Landrum. Aquat Toxicol 52:251-267
Midge	Invertebrate	Fresh	Larval	Mortality	404.19	LD78	Ingestion	Whole Body	2001. Hwang, H., S.W. Fisher, P.F. Landrum. Aquat Toxicol 52:251-267
Midge	Invertebrate	Fresh	Larval	Mortality	483.58	LD88	Ingestion	Whole Body	2001. Hwang, H., S.W. Fisher, P.F. Landrum. Aquat Toxicol 52:251-267
Midge	Invertebrate	Fresh	Immature	Mortality	1.02	NOED	Combined	Whole Body	1972. Sanders, H.O., Chandler, J.H.. Bull Environ Contam Toxicol
Midge	Invertebrate	Fresh	Immature	Mortality	1.2	NOED	Combined	Whole Body	1972. Sanders, H.O., Chandler, J.H.. Bull Environ Contam Toxicol
Midge	Invertebrate	Fresh	Larval	Reproduction	5.774	LOED	Ingestion	Whole Body	2001. Hwang, H., S.W. Fisher, P.F. Landrum. Aquat Toxicol 52:251-267
Midge	Invertebrate	Fresh	Larval	Reproduction	10.105	LOED	Ingestion	Whole Body	2001. Hwang, H., S.W. Fisher, P.F. Landrum. Aquat Toxicol 52:251-267
Midge	Invertebrate	Fresh	Larval	Reproduction	111.87	LOED	Ingestion	Whole Body	2001. Hwang, H., S.W. Fisher, P.F. Landrum. Aquat Toxicol 52:251-267
Mosquito	Invertebrate	Fresh	Immature	Mortality	5.4	NOED	Combined	Whole Body	1972. Sanders, H.O., Chandler, J.H.. Bull Environ Contam Toxicol
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.00076	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.0008	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.0012	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.0013	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.0018	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.0028	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.0028	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.004	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.011	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.0116	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.0138	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.0186	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.0246	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Growth	0.026	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Mature	Mortality	10.4	NOED	Combined	Whole Body	1972. Sanders, H.O., Chandler, J.H.. Bull Environ Contam Toxicol
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.00076	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.0008	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.0012	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.0013	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.0018	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.0028	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.0028	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.004	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.011	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.0116	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.0138	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.0186	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.0246	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Reproduction	0.026	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.0004	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.00076	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.0008	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.0012	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.0013	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.0018	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.0028	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.004	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem

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Table B-38 Effects Based Tissue Concentrations for Invertebrates - PCBs

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.011	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.0116	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.0138	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.0186	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.0246	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem
Water flea	Invertebrate	Fresh	Neonate to adult	Survival	0.026	NOED	Water	Whole Body	1990. Dillon TM , WH Benson, RA Stackhouse, AM Crider. Environ Tox & Chem

Table B-39. Effects Based Tissue Concentrations for Invertebrates - Selenium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Midge	Invertebrate	Fresh	Egg	Growth	0.2	ED40	Combined	Whole Body	1994. Alaimo, J., R.S. Ogle and A.W. Knight. Arch Environ Contam Toxicol 27:441-448
Midge	Invertebrate	Fresh	Egg	Growth	2	ED54	Combined	Whole Body	1994. Alaimo, J., R.S. Ogle and A.W. Knight. Arch Environ Contam Toxicol 27:441-448
Midge	Invertebrate	Fresh	Egg	Growth	4.4	ED68	Combined	Whole Body	1994. Alaimo, J., R.S. Ogle and A.W. Knight. Arch Environ Contam Toxicol 27:441-448
Midge	Invertebrate	Fresh	Larval	Growth	0.51	LOED	Ingestion	Whole Body	1995. Malchow, D.E., A.W. Knight and K.J. Maier. Arch Environ Contam Toxicol 29:104-109
Midge	Invertebrate	Fresh	Larval	Mortality	12.6	LD50	Absorption	Whole Body	1993. Maier, K.J. and A.W. Knight. Arch Environ Contam Toxicol 25:365-370
Midge	Invertebrate	Fresh	Larval	Mortality	17	LD50	Absorption	Whole Body	1993. Maier, K.J. and A.W. Knight. Arch Environ Contam Toxicol 25:365-370
Water flea	Invertebrate	Fresh	Larval	Growth	4.22	ED104	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Growth	2.94	ED105	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Growth	2.94	ED24	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Growth	6.34	ED36	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Immature	Growth	6.34	ED36	Absorption	Whole Body	1990. Ingersoll, C.G., F.J. Dwyer and T.W. May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Growth	10.2	ED42	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Immature	Growth	10.2	ED42	Absorption	Whole Body	1990. Ingersoll, C.G., F.J. Dwyer and T.W. May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Immature	Growth	2.94	LOED	Absorption	Whole Body	1990. Ingersoll, C.G., F.J. Dwyer and T.W. May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Immature	Growth	3	LOED	Combined	Whole Body	1993. Besser, J.M., T.J. Canfield and T.W. Lapoint. Environ Tox & Chem 12:57-72.
Water flea	Invertebrate	Fresh	Immature	Growth	4.22	NOED	Absorption	Whole Body	1990. Ingersoll, C.G., F.J. Dwyer and T.W. May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Immature	Growth	20.4	NOED	Combined	Whole Body	1993. Besser, J.M., T.J. Canfield and T.W. Lapoint. Environ Tox & Chem 12:57-72.
Water flea	Invertebrate	Fresh	Adult	Mortality	3.42	LD95	Water	Whole Body	1996. Ogle RS, AW Knight. Arch Environ Contam Toxicol 30:274-279
Water flea	Invertebrate	Fresh	Immature	Mortality	29.6	LOED	Combined	Whole Body	1993. Besser, J.M., T.J. Canfield and T.W. Lapoint. Environ Tox & Chem 12:57-72.
Water flea	Invertebrate	Fresh	Immature	Mortality	10.2	NOED	Absorption	Whole Body	1990. Ingersoll, C.G., F.J. Dwyer and T.W. May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Reproduction	6.34	ED11	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Reproduction	10.2	ED11	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Reproduction	10.2	ED37	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Reproduction	6.34	ED47	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Reproduction	6.34	ED47	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Reproduction	6.34	ED47	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Immature	Reproduction	10.2	ED70	Absorption	Whole Body	1990. Ingersoll, C.G., F.J. Dwyer and T.W. May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Reproduction	10.2	ED71	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Larval	Reproduction	10.2	ED72	Water	Whole Body	1990. Ingersoll CG, FJ Dwyer, and TW May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Immature	Reproduction	6.34	LOED	Absorption	Whole Body	1990. Ingersoll, C.G., F.J. Dwyer and T.W. May. Environ Tox & Chem 09:1171-1181
Water flea	Invertebrate	Fresh	Immature	Reproduction	2.94	NOED	Absorption	Whole Body	1990. Ingersoll, C.G., F.J. Dwyer and T.W. May. Environ Tox & Chem 09:1171-1181

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Table B-40. Effects Based Tissue Concentrations for Invertebrates - Silver

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Clam - Asiatic	Invertebrate	Fresh	Immature	Growth	1650	LOED	Absorption	Whole Body	1990. Diamond, J.M., D.G. Mackler, M. Collins and D. Gruber. Environ Tox & Chem 09:1425-1434
Clam - Asiatic	Invertebrate	Fresh	Immature	Growth	800	NOED	Absorption	Whole Body	1990. Diamond, J.M., D.G. Mackler, M. Collins and D. Gruber. Environ Tox & Chem 09:1425-1434
Clam - Asiatic	Invertebrate	Fresh	Immature	Mortality	2510	LOED	Absorption	Whole Body	1990. Diamond, J.M., D.G. Mackler, M. Collins and D. Gruber. Environ Tox & Chem 09:1425-1434
Clam - Asiatic	Invertebrate	Fresh	Immature	Mortality	1650	NOED	Absorption	Whole Body	1990. Diamond, J.M., D.G. Mackler, M. Collins and D. Gruber. Environ Tox & Chem 09:1425-1434
Crayfish - Red Swamp	Invertebrate	Fresh	Adult	Growth	84.6	NOED	Ingestion	Hepatopancreas	2004. Mann RM, M Grosell, A Bianchini, CM Wood. Environ Tox & Chem 23:388-395
Crayfish - Red Swamp	Invertebrate	Fresh	Adult	Mortality	84.6	NOED	Ingestion	Hepatopancreas	2004. Mann RM, M Grosell, A Bianchini, CM Wood. Environ Tox & Chem 23:388-395
Crayfish - Red Swamp	Invertebrate	Fresh	Adult	Reproduction	84.6	NOED	Ingestion	Hepatopancreas	2004. Mann RM, M Grosell, A Bianchini, CM Wood. Environ Tox & Chem 23:388-395
Water flea	Invertebrate	Fresh	Juvenile	Growth	0.49	NOED	Water	Whole Body	2007. Naddy RB, JW Gorsuch, AB Rehner, GR McNerney, RA Bell, JR Kramer. Aquatic Toxicol 84:1-10
Water flea	Invertebrate	Fresh	Immature	Mortality	2	LD50	Water	Whole Body	2002. Bianchini A., K.C. Bowles, C.J. Brauner, J.R. Kramer, C.M. Wood. Environ Tox & Chem 21(6) 1294-1300
Water flea	Invertebrate	Fresh	Juvenile	Mortality	0.175	LD50	Water	Whole Body	2003. Bianchini Adalto and Chris Wood. Environ Tox & Chem 22 (6), 1361-1367
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	0.59	EC24	Water	Whole Body	2007. Naddy RB, JW Gorsuch, AB Rehner, GR McNerney, RA Bell, JR Kramer. Aquatic Toxicol 84:1-10
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	0.23	ED121	Ingestion	Whole Body	2004. Glover CN, CM Wood. Comp Biochem Physiol 139C: 273-280
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	0.25	ED128	Ingestion	Whole Body	2004. Glover CN, CM Wood. Comp Biochem Physiol 139C: 273-280
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	0.23	NOED	Ingestion	Whole Body	2004. Glover CN, CM Wood. Comp Biochem Physiol 139C: 273-280
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	0.23	NOED	Ingestion	Whole Body	2004. Glover CN, CM Wood. Comp Biochem Physiol 139C: 273-280

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Table B-41. Effects Based Tissue Concentrations for Invertebrates - Thallium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	41.9	LOED	Water	Whole Body	1998. Borgmann U, V Cheam, WP Norwood, J Lechner. Environ Pollut 099:105-114
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Growth	48.44	LOED	Water	Whole Body	1998. Borgmann U, V Cheam, WP Norwood, J Lechner. Environ Pollut 099:105-114
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	59.271	LD25	Water	Whole body	2001. Borgmann U, WP Norwood, TB Reynoldson, and F Rosa. Can J Fish Aquat Sci 58:950-960
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	58.67	LOED	Water	Whole Body	1998. Borgmann U, V Cheam, WP Norwood, J Lechner. Environ Pollut 099:105-114
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	82.78	LOED	Water	Whole Body	1998. Borgmann U, V Cheam, WP Norwood, J Lechner. Environ Pollut 099:105-114
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Reproduction	12.06	LOED	Water	Whole Body	1998. Borgmann U, V Cheam, WP Norwood, J Lechner. Environ Pollut 099:105-114

Table B-42. Effects Based Tissue Concentrations for Invertebrates - Zinc

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	105.8	LD100	Absorption	Whole Body	1997. Borgmann, U., and W.P. Norwood. Can J Fish Aquat Sci 54:1046-1054
Amphipod - Freshwater	Invertebrate	Fresh	Juvenile	Mortality	117.8	LD100	Absorption	Whole Body	1997. Borgmann, U., and W.P. Norwood. Can J Fish Aquat Sci 54:1046-1054
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	117.1	LD100	Combined	Whole Body	1997. Borgmann U, WP Norwood. Can J Fish Aquat Sci 54:1055-1063
Amphipod - Freshwater	Invertebrate	Fresh	Juvenile	Mortality	19.5	LD25	Absorption	Whole Body	1997. Borgmann, U., and W.P. Norwood. Can J Fish Aquat Sci 54:1046-1054
Amphipod - Freshwater	Invertebrate	Fresh	Juvenile	Mortality	40.3	LD25	Absorption	Whole Body	1997. Borgmann, U., and W.P. Norwood. Can J Fish Aquat Sci 54:1046-1054
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	72.7	LD25	Absorption	Whole Body	1997. Borgmann, U., and W.P. Norwood. Can J Fish Aquat Sci 54:1046-1054
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	289.023	LD25	Water	Whole body	2001. Borgmann U, WP Norwood, TB Reynoldson, and F Rosa. Can J Fish Aquat Sci 58:950-960
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	49.04	LD25	Combined	Whole Body	1997. Borgmann U, WP Norwood. Can J Fish Aquat Sci 54:1055-1063
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	117.8	LD40	Absorption	Whole Body	1997. Borgmann, U., and W.P. Norwood. Can J Fish Aquat Sci 54:1046-1054
Amphipod - Freshwater	Invertebrate	Fresh	Immature	Mortality	54.9	LD45	Combined	Whole Body	1997. Borgmann U, WP Norwood. Can J Fish Aquat Sci 54:1055-1063
Amphipod - Freshwater	Invertebrate	Fresh	Juvenile	Mortality	50.2	LD50	Absorption	Whole Body	1997. Borgmann, U., and W.P. Norwood. Can J Fish Aquat Sci 54:1046-1054
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	90.6	LD50	Absorption	Whole Body	1997. Borgmann, U., and W.P. Norwood. Can J Fish Aquat Sci 54:1046-1054
Amphipod - Freshwater	Invertebrate	Fresh	Juvenile	Mortality	60.8	LD67	Absorption	Whole Body	1997. Borgmann, U., and W.P. Norwood. Can J Fish Aquat Sci 54:1046-1054
Amphipod - Freshwater	Invertebrate	Fresh	Juvenile	Mortality	53.6	NOED	Absorption	Whole Body	1997. Borgmann, U., and W.P. Norwood. Can J Fish Aquat Sci 54:1046-1054
Amphipod - Freshwater	Invertebrate	Fresh	Adult	Mortality	60.8	NOED	Absorption	Whole Body	1997. Borgmann, U., and W.P. Norwood. Can J Fish Aquat Sci 54:1046-1054
Clam - Asiatic	Invertebrate	Fresh	Adult	Mortality	60	LD100	Combined	Soft Tissue	2006. Marie V, M Baudrimont, A Boudou. Chemosphere 65:609-617
Crayfish	Invertebrate	Fresh	Adult	Mortality	12.9	LD23	Absorption	Exoskeleton	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	24.8	LD23	Absorption	Intestine	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	35.2	LD23	Absorption	Whole Body	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	85.6	LD23	Absorption	Hepatopancreas	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	325.6	LD23	Absorption	Gill	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	19	LD23	Absorption	Abdomen	1973. Zitko, V. and P.M.K. Choi.. Bull Environ Contam Toxicol 10(2):120-122
Crayfish	Invertebrate	Fresh	Adult	Mortality	17.2	LD43	Absorption	Exoskeleton	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	20	LD43	Absorption	Abdomen	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	37.8	LD43	Absorption	Whole Body	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	42.7	LD43	Absorption	Intestine	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	111	LD43	Absorption	Hepatopancreas	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	434	LD43	Absorption	Gill	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	24.5	LD61	Absorption	Exoskeleton	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	24.7	LD61	Absorption	Abdomen	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	44.4	LD61	Absorption	Intestine	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	69.2	LD61	Absorption	Whole Body	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	127.7	LD61	Absorption	Hepatopancreas	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	1195	LD61	Absorption	Gill	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	7.2	NOED	Absorption	Exoskeleton	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	12.7	NOED	Absorption	Whole Body	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	17.8	NOED	Absorption	Abdomen	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	20.2	NOED	Absorption	Intestine	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	42.5	NOED	Absorption	Hepatopancreas	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Crayfish	Invertebrate	Fresh	Adult	Mortality	66.7	NOED	Absorption	Gill	1986. Mirenda, R.J.. Bull Environ Contam Toxicol 37:387-394
Midge	Invertebrate	Fresh	Larval	Growth	180	ED44	Water	Whole Body	1992. Timmermans KR, W Peeters, and M. Tonkes. Hydrobiologia 241:119-134.
Midge	Invertebrate	Fresh	Larval	Growth	382	ED50	Combined	Whole Body	2006. Bidwell JR, JR Gorrie. Environ Pollut 139-206-213
Midge	Invertebrate	Fresh	Larval	Growth	314	ED59	Combined	Whole Body	2006. Bidwell JR, JR Gorrie. Environ Pollut 139-206-213
Midge	Invertebrate	Fresh	Larval	Growth	275	ED62	Combined	Whole Body	2006. Bidwell JR, JR Gorrie. Environ Pollut 139-206-213
Midge	Invertebrate	Fresh	Larval	Growth	706	ED65	Combined	Whole Body	2006. Bidwell JR, JR Gorrie. Environ Pollut 139-206-213
Midge	Invertebrate	Fresh	Egg	Growth	1187	NOED	Combined	Whole Body	2004. Mann RM, M Grosell, A Bianchini, CM Wood. Environ Tox & Chem 23:388-395
Midge	Invertebrate	Fresh	Egg	Growth	745	NOED	Combined	Whole Body	2004. Mann RM, M Grosell, A Bianchini, CM Wood. Environ Tox & Chem 23:388-395
Midge	Invertebrate	Fresh	Larval	Mortality	275	ED28	Combined	Whole Body	2006. Bidwell JR, JR Gorrie. Environ Pollut 139-206-213
Midge	Invertebrate	Fresh	Larval	Mortality	314	ED70	Combined	Whole Body	2006. Bidwell JR, JR Gorrie. Environ Pollut 139-206-213
Midge	Invertebrate	Fresh	Larval	Mortality	706	ED85	Combined	Whole Body	2006. Bidwell JR, JR Gorrie. Environ Pollut 139-206-213
Midge	Invertebrate	Fresh	Larval	Mortality	183	LD10	Water	Whole Body	1992. Timmermans KR, W Peeters, and M. Tonkes. Hydrobiologia 241:119-134.
Midge	Invertebrate	Fresh	Larval	Mortality	524	LD6	Water	Whole Body	1992. Timmermans KR, W Peeters, and M. Tonkes. Hydrobiologia 241:119-134.
Midge	Invertebrate	Fresh	Larval	Mortality	382	NOED	Combined	Whole Body	2006. Bidwell JR, JR Gorrie. Environ Pollut 139-206-213

Table B-42. Effects Based Tissue Concentrations for Invertebrates - Zinc

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Water flea	Invertebrate	Fresh	Juvenile	Growth	40	ED11	Water	Whole Body	2006. Muyssen BTA, KAC De Schamphelaere, CR Janssen. Aquatic Toxicol 77:393-401
Water flea	Invertebrate	Fresh	Juvenile	Growth	30.4	ED131	Water	Whole Body	2006. Muyssen BTA, KAC De Schamphelaere, CR Janssen. Aquatic Toxicol 77:393-401
Water flea	Invertebrate	Fresh	Juvenile	Growth	40	ED23	Water	Whole Body	2006. Muyssen BTA, KAC De Schamphelaere, CR Janssen. Aquatic Toxicol 77:393-401
Water flea	Invertebrate	Fresh	Juvenile	Growth	34.6	ED33	Water	Whole Body	2006. Muyssen BTA, KAC De Schamphelaere, CR Janssen. Aquatic Toxicol 77:393-401
Water flea	Invertebrate	Fresh	Juvenile	Growth	56.2	ED58	Water	Whole Body	2006. Muyssen BTA, KAC De Schamphelaere, CR Janssen. Aquatic Toxicol 77:393-401
Water flea	Invertebrate	Fresh	NA	Growth	16.8	NOED	Water	Whole Body	2004. De Schamphelaere KAC, M Canli, V Van Lierde, I Forrez, F Vanhaecke, CR Janssen. Aquat Toxicol 70:233-244
Water flea	Invertebrate	Fresh	Juvenile	Mortality	30.4	LD14	Water	Whole Body	2006. Muyssen BTA, KAC De Schamphelaere, CR Janssen. Aquatic Toxicol 77:393-401
Water flea	Invertebrate	Fresh	Juvenile	Mortality	34.6	LD19	Water	Whole Body	2006. Muyssen BTA, KAC De Schamphelaere, CR Janssen. Aquatic Toxicol 77:393-401
Water flea	Invertebrate	Fresh	Juvenile	Mortality	56.2	LD93	Water	Whole Body	2006. Muyssen BTA, KAC De Schamphelaere, CR Janssen. Aquatic Toxicol 77:393-401
Water flea	Invertebrate	Fresh	NA	Mortality	16.8	NOED	Water	Whole Body	2004. De Schamphelaere KAC, M Canli, V Van Lierde, I Forrez, F Vanhaecke, CR Janssen. Aquat Toxicol 70:233-244
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	30.4	ED13	Water	Whole Body	2006. Muyssen BTA, KAC De Schamphelaere, CR Janssen. Aquatic Toxicol 77:393-401
Water flea	Invertebrate	Fresh	Juvenile	Reproduction	34.6	ED14	Water	Whole Body	2006. Muyssen BTA, KAC De Schamphelaere, CR Janssen. Aquatic Toxicol 77:393-401
Water flea	Invertebrate	Fresh	NA	Reproduction	11.12	ED60	Water	Whole Body	2004. De Schamphelaere KAC, M Canli, V Van Lierde, I Forrez, F Vanhaecke, CR Janssen. Aquat Toxicol 70:233-244
Water flea	Invertebrate	Fresh	NA	Reproduction	16.8	ED62	Water	Whole Body	2004. De Schamphelaere KAC, M Canli, V Van Lierde, I Forrez, F Vanhaecke, CR Janssen. Aquat Toxicol 70:233-244
Water flea	Invertebrate	Fresh	NA	Reproduction	11.12	LOED	Water	Whole Body	2004. De Schamphelaere KAC, M Canli, V Van Lierde, I Forrez, F Vanhaecke, CR Janssen. Aquat Toxicol 70:233-244
Water flea	Invertebrate	Fresh	NA	Reproduction	16.8	NOED	Water	Whole Body	2004. De Schamphelaere KAC, M Canli, V Van Lierde, I Forrez, F Vanhaecke, CR Janssen. Aquat Toxicol 70:233-244

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Table B-43. Acronyms for Effects Based Tissue Concentrations for Invertebrates

ECXX = effect concentration for XX% of test population
EDXX = effect dose for XX% of test population
IPXX = undefined
kg = kilogram
LCXX = concentration lethal to XX% of test population
LDXX = dose lethal to XX% of test population
LOED = lowest observable effect dose
mg = milligram
NA = not applicable
NOED = no observable effect dose
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
ww = wet weight

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Appendix C

Exposure Pathways – Fish

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum nitrate	Arctic Char	Fish	Fresh	Mortality	NR	Not Reported	T	399	NA	NR	ug/L	LAB	1997. Poleo, A.B.S., K. Ostbye, S.A. Oxnevad, R.A. Andersen, E. Heibo, and L.A. Vollestad. Toxicity of Acid Aluminium-Rich Water to Seven Freshwater Fish Species: A Comparative Laboratory Study. Environ. Pollut.96(2): 129-139.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Growth	LOEC	Not Reported	T	264	D	105	ug/L	LAB	1995. Buckler, D.R., L. Cleveland, E.E. Little, and W.G. Brumbaugh. Survival, Sublethal Responses, and Tissue Residues of Atlantic Salmon Exposed to Acidic pH and Aluminum. Aquat. Toxicol.31(3): 203-216.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Growth	LOEC	Not Reported	T	71	NR	NR	ug/L	LAB	1995. Buckler, D.R., L. Cleveland, E.E. Little, and W.G. Brumbaugh. Survival, Sublethal Responses, and Tissue Residues of Atlantic Salmon Exposed to Acidic pH and Aluminum. Aquat. Toxicol.31(3): 203-216.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Growth	LOEC	Whole Organism	T	124	NR	NR	ug/L	LAB	1989. McKee, M.J., C.O. Knowles, and D.R. Buckler. Effects of Aluminum on the Biochemical Composition of Atlantic Salmon. Arch. Environ. Contam. Toxicol.18(1-2): 243-248.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	T	264	NR	NR	ug/L	LAB	1989. McKee, M.J., C.O. Knowles, and D.R. Buckler. Effects of Aluminum on the Biochemical Composition of Atlantic Salmon. Arch. Environ. Contam. Toxicol.18(1-2): 243-248.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	T	264	NR	NR	ug/L	LAB	1989. McKee, M.J., C.O. Knowles, and D.R. Buckler. Effects of Aluminum on the Biochemical Composition of Atlantic Salmon. Arch. Environ. Contam. Toxicol.18(1-2): 243-248.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	T	264	NR	NR	ug/L	LAB	1989. McKee, M.J., C.O. Knowles, and D.R. Buckler. Effects of Aluminum on the Biochemical Composition of Atlantic Salmon. Arch. Environ. Contam. Toxicol.18(1-2): 243-248.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Not Reported	T	124	D	70	ug/L	LAB	1995. Buckler, D.R., L. Cleveland, E.E. Little, and W.G. Brumbaugh. Survival, Sublethal Responses, and Tissue Residues of Atlantic Salmon Exposed to Acidic pH and Aluminum. Aquat. Toxicol.31(3): 203-216.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Not Reported	T	33	NR	NR	ug/L	LAB	1995. Buckler, D.R., L. Cleveland, E.E. Little, and W.G. Brumbaugh. Survival, Sublethal Responses, and Tissue Residues of Atlantic Salmon Exposed to Acidic pH and Aluminum. Aquat. Toxicol.31(3): 203-216.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	T	264	NR	NR	ug/L	LAB	1989. McKee, M.J., C.O. Knowles, and D.R. Buckler. Effects of Aluminum on the Biochemical Composition of Atlantic Salmon. Arch. Environ. Contam. Toxicol.18(1-2): 243-248.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	T	264	NR	NR	ug/L	LAB	1989. McKee, M.J., C.O. Knowles, and D.R. Buckler. Effects of Aluminum on the Biochemical Composition of Atlantic Salmon. Arch. Environ. Contam. Toxicol.18(1-2): 243-248.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	T	71	NR	NR	ug/L	LAB	1989. McKee, M.J., C.O. Knowles, and D.R. Buckler. Effects of Aluminum on the Biochemical Composition of Atlantic Salmon. Arch. Environ. Contam. Toxicol.18(1-2): 243-248.
Aluminum chloride (AlCl3)	Atlantic Salmon	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	mM	LAB	1983. Eddy, F.B., and C. Talbot. Formation of the Perivitelline Fluid in Atlantic Salmon Eggs (Salmo salar) in Fresh Water and in Solutions of Metal Ions. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.75(1): 1-4.
Aluminum chloride (AlCl3)	Atlantic Salmon	Fish	Fresh	Growth	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1995. Hamilton, S.J., and T.A. Haines. Influence of Fluoride on Aluminum Toxicity to Atlantic Salmon (Salmo salar). Can. J. Fish. Aquat. Sci.52(11): 2432-2444.
Aluminum chloride (AlCl3)	Atlantic Salmon	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDA	1997. Jagoe, C.H., and T.A. Haines. Changes in Gill Morphology of Atlantic Salmon (Salmo salar) Smolts due to Addition of Acid and Aluminum to Stream Water. Environ. Pollut.97(1-2): 137-146.
Aluminum chloride (AlCl3)	Atlantic Salmon	Fish	Fresh	Growth	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1984. Staurnes, M., T. Sigholt, and O.B. Reite. Reduced Carbonic Anhydrase and Na-K-ATPase Activity in Gills of Salmonids Exposed to Aluminium-Containing Acid Water. Experientia40: 226-227.
Aluminum chloride (AlCl3)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	584	NA	NR	ug/L	LAB	1995. Hamilton, S.J., and T.A. Haines. Influence of Fluoride on Aluminum Toxicity to Atlantic Salmon (Salmo salar). Can. J. Fish. Aquat. Sci.52(11): 2432-2444.
Aluminum chloride (AlCl3)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	599	NA	NR	ug/L	LAB	1995. Hamilton, S.J., and T.A. Haines. Influence of Fluoride on Aluminum Toxicity to Atlantic Salmon (Salmo salar). Can. J. Fish. Aquat. Sci.52(11): 2432-2444.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	2.9	NA	NR	uM	LAB	1997. Roy, R.L., and P.G.C. Campbell. Decreased Toxicity of Al to Juvenile Atlantic Salmon (Salmo salar) in Acidic Soft Water Containing Natural Organic Matter: A Test of the Free-Ion Model. Environ. Toxicol. Chem.16(9): 1962-1969.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	4.6	NA	NR	uM	LAB	1997. Roy, R.L., and P.G.C. Campbell. Decreased Toxicity of Al to Juvenile Atlantic Salmon (Salmo salar) in Acidic Soft Water Containing Natural Organic Matter: A Test of the Free-Ion Model. Environ. Toxicol. Chem.16(9): 1962-1969.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	2.8	NA	NR	uM	LAB	1995. Roy, R., and P.G.C. Campbell. Survival Time Modeling of Exposure of Juvenile Atlantic Salmon (Salmo salar) to Mixture of Aluminum and Zinc in Soft Water at Low pH. Aquat. Toxicol.33(2): 155-176.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	4	NA	NR	uM	LAB	1997. Roy, R.L., and P.G.C. Campbell. Decreased Toxicity of Al to Juvenile Atlantic Salmon (Salmo salar) in Acidic Soft Water Containing Natural Organic Matter: A Test of the Free-Ion Model. Environ. Toxicol. Chem.16(9): 1962-1969.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1.9	NA	NR	uM	LAB	1995. Roy, R., and P.G.C. Campbell. Survival Time Modeling of Exposure of Juvenile Atlantic Salmon (Salmo salar) to Mixture of Aluminum and Zinc in Soft Water at Low pH. Aquat. Toxicol.33(2): 155-176.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NA	NR	uM	LAB	1995. Roy, R., and P.G.C. Campbell. Survival Time Modeling of Exposure of Juvenile Atlantic Salmon (Salmo salar) to Mixture of Aluminum and Zinc in Soft Water at Low pH. Aquat. Toxicol.33(2): 155-176.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	4.5	NA	NR	uM	LAB	1995. Roy, R., and P.G.C. Campbell. Survival Time Modeling of Exposure of Juvenile Atlantic Salmon (Salmo salar) to Mixture of Aluminum and Zinc in Soft Water at Low pH. Aquat. Toxicol.33(2): 155-176.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	9.6	NA	NR	uM	LAB	1995. Roy, R., and P.G.C. Campbell. Survival Time Modeling of Exposure of Juvenile Atlantic Salmon (Salmo salar) to Mixture of Aluminum and Zinc in Soft Water at Low pH. Aquat. Toxicol.33(2): 155-176.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	10.5	NA	NR	uM	LAB	1995. Roy, R., and P.G.C. Campbell. Survival Time Modeling of Exposure of Juvenile Atlantic Salmon (Salmo salar) to Mixture of Aluminum and Zinc in Soft Water at Low pH. Aquat. Toxicol.33(2): 155-176.
Aluminum sulfate	Atlantic Salmon	Fish	Fresh	Mortality	LC50		I	51			ug/L	LAB	1995. Roy and Campbell. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum sulfate	Atlantic Salmon	Fish	Fresh	Mortality	LC50		I	54			ug/L	LAB	1995. Roy and Campbell. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum sulfate	Atlantic Salmon	Fish	Fresh	Mortality	LC50		I	76			ug/L	LAB	1995. Roy and Campbell. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum sulfate	Atlantic Salmon	Fish	Fresh	Mortality	LC50		I	122			ug/L	LAB	1995. Roy and Campbell. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum sulfate	Atlantic Salmon	Fish	Fresh	Mortality	LC50		I	259			ug/L	LAB	1995. Roy and Campbell. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum sulfate	Atlantic Salmon	Fish	Fresh	Mortality	LC50		I	284			ug/L	LAB	1995. Roy and Campbell. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	264	D	105	ug/L	LAB	1995. Buckler, D.R., L. Cleveland, E.E. Little, and W.G. Brumbaugh. Survival, Sublethal Responses, and Tissue Residues of Atlantic Salmon Exposed to Acidic pH and Aluminum. Aquat. Toxicol.31(3): 203-216.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	264	D	105	ug/L	LAB	1995. Buckler, D.R., L. Cleveland, E.E. Little, and W.G. Brumbaugh. Survival, Sublethal Responses, and Tissue Residues of Atlantic Salmon Exposed to Acidic pH and Aluminum. Aquat. Toxicol.31(3): 203-216.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	124	D	70	ug/L	LAB	1995. Buckler, D.R., L. Cleveland, E.E. Little, and W.G. Brumbaugh. Survival, Sublethal Responses, and Tissue Residues of Atlantic Salmon Exposed to Acidic pH and Aluminum. Aquat. Toxicol.31(3): 203-216.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	124	D	70	ug/L	LAB	1995. Buckler, D.R., L. Cleveland, E.E. Little, and W.G. Brumbaugh. Survival, Sublethal Responses, and Tissue Residues of Atlantic Salmon Exposed to Acidic pH and Aluminum. Aquat. Toxicol.31(3): 203-216.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	124	D	70	ug/L	LAB	1995. Buckler, D.R., L. Cleveland, E.E. Little, and W.G. Brumbaugh. Survival, Sublethal Responses, and Tissue Residues of Atlantic Salmon Exposed to Acidic pH and Aluminum. Aquat. Toxicol.31(3): 203-216.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	71	NR	NR	ug/L	LAB	1995. Buckler, D.R., L. Cleveland, E.E. Little, and W.G. Brumbaugh. Survival, Sublethal Responses, and Tissue Residues of Atlantic Salmon Exposed to Acidic pH and Aluminum. Aquat. Toxicol.31(3): 203-216.
Aluminum	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	D	NR	ug/L	FIELDN	1993. Norrgren, L., and E. Degerman. Effects of Different Water Qualities on the Early Development of Atlantic Salmon and Brown Trout Exposed In Situ. Ambio22(4): 213-218.
Aluminum	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	D	NR	ug/L	FIELDN	1993. Norrgren, L., and E. Degerman. Effects of Different Water Qualities on the Early Development of Atlantic Salmon and Brown Trout Exposed In Situ. Ambio22(4): 213-218.
Aluminum chloride (AlCl3)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1995. Hamilton, S.J., and T.A. Haines. Influence of Fluoride on Aluminum Toxicity to Atlantic Salmon (Salmo salar). Can. J. Fish. Aquat. Sci.52(11): 2432-2444.
Aluminum chloride (AlCl3)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	330	NR	NR	ug/L	LAB	1999. Brodeur, J.C., T. Ytrestoyl, B. Finstad, and R.S. McKinley. Increase of Heart Rate Without Elevation of Cardiac Output in Adult Atlantic Salmon (Salmo salar) Exposed to Acidic Water and Aluminium. Can. J. Fish. Aquat. Sci.56(2): 184-190.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. McKee, M.J., C.O. Knowles, and D.R. Buckler. Effects of Aluminum on the Biochemical Composition of Atlantic Salmon. Arch. Environ. Contam. Toxicol.18(1-2): 243-248.
Aluminum	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR	D	NR	ug/L	LAB	1993. Poleo, A.B.S., and I.P. Muniz. The Effect of Aluminium in Soft Water at Low pH and Different Temperatures on Mortality, Ventilation Frequency and Water Balance in Smoltifying. Environ. Biol. Fishes36(2): 193-203.
Sulfuric acid, Aluminum salt (3:2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	D	NR	ug/L	LAB	1993. Poleo, A.B.S., and I.P. Muniz. The Effect of Aluminium in Soft Water at Low pH and Different Temperatures on Mortality, Ventilation Frequency and Water Balance in Smoltifying. Environ. Biol. Fishes36(2): 193-203.
Aluminum chloride (AlCl3)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	FIELDA	1997. Jagoe, C.H., and T.A. Haines. Changes in Gill Morphology of Atlantic Salmon (Salmo salar) Smolts due to Addition of Acid and Aluminum to Stream Water. Environ. Pollut.97(1-2): 137-146.
Aluminum chloride (AlCl3)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	61	NR	NR	ug/L	FIELDA	1987. Skogheim, O.K., B.O. Rosseland, F. Kroglund, and G. Hagenlund. Addition of NaOH, Limestone Slurry and Finegrained Limestone to Acidified Lake Water and the Effects on Smolts of Atlantic Salmon (Salmo salar L.). Water Res.21(4): 435-443.
Sulfuric acid, Aluminum salt (3:2)	Australian Bass	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Hyne, R.V., and S.P. Wilson. Toxicity of Acid-Sulphate Soil Leachate and Aluminium to the Embryos and Larvae of Australian Bass (Macquaria novemaculeata) in Estuarine Water. Environ. Pollut.97(3): 221-227.
Sulfuric acid, Aluminum salt (3:2)	Bluegill	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Sulfuric acid, Aluminum salt (3:2)	Bony Fishes	Fish	Fresh	Mortality	NR	Not Reported	T	500000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Sulfuric acid, Aluminum salt (3:2)	Bony Fishes	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	292	D	27	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	88	D	26	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	169	D	26	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	292	D	27	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	169	D	26	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	292	D	27	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	142	D	24	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	169	D	26	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	142	D	24	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	57	D	13	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	142	D	24	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	88	D	26	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	142	D	24	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	88	D	26	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	68	D	15	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	88	D	26	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Aluminum	Brook Trout	Fish	Fresh	Growth	NR		T	268	NA	NR	ug/L	LAB	1991. Cleveland, L., D.R. Buckler, and W.G. Brumbaugh. Residue Dynamics and Effects of Aluminum on Growth and Mortality in Brook Trout. Environ. Toxicol. Chem.10(2): 243-248.
Aluminum chloride (AlCl3)	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Baker, J.P., and C.L. Schofield. Aluminum Toxicity to Fish in Acidic Waters. Water Air Soil Pollut.18: 289-309.
Aluminum chloride (AlCl3)	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1982. Baker, J.P., and C.L. Schofield. Aluminum Toxicity to Fish in Acidic Waters. Water Air Soil Pollut.18: 289-309.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1986. Cleveland, L., E.E. Little, S.J. Hamilton, D.R. Buckler, and J.B. Hunn. Interactive Toxicity of Aluminum and Acidity to Early Life Stages of Brook Trout. Trans. Am. Fish. Soc.115: 610-620.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1986. Cleveland, L., E.E. Little, S.J. Hamilton, D.R. Buckler, and J.B. Hunn. Interactive Toxicity of Aluminum and Acidity to Early Life Stages of Brook Trout. Trans. Am. Fish. Soc.115: 610-620.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1986. Cleveland, L., E.E. Little, S.J. Hamilton, D.R. Buckler, and J.B. Hunn. Interactive Toxicity of Aluminum and Acidity to Early Life Stages of Brook Trout. Trans. Am. Fish. Soc.115: 610-620.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Growth	NR		T	283	NA	NR	ug/L	LAB	1987. Hunn, J.B., L. Cleveland, and E.E. Little. Influence of pH and Aluminum on Developing Brook Trout in a Low Calcium Water. Environ. Pollut.43(1): 63-73.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	88	D	26	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	29	D	13	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	292	D	27	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	350	D	22	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	292	D	27	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	350	D	22	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	142	NR	24	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	169	D	26	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	57	NR	13	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	8	NR	NR	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	142	D	24	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	169	D	26	ug/L	LAB	1989. Cleveland, L., E.E. Little, R.H. Wiedmeyer, and D.R. Buckler. Chronic No-Observed-Effect Concentrations of Aluminum for Brook Trout Exposed in Low-Calcium, Dilute Acidic Water. In: T.E.Lewis (Ed.), Environmental Chemistry and Toxicology of Aluminum, Chapter 13, Lewis Publ., Chelsea, MI: 229-246.
Aluminum	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1993. Gagen, C.J., W.E. Sharpe, and R.F. Carline. Mortality of Brook Trout, Mottled Sculpins, and Slimy Sculpins During Acidic Episodes. Trans. Am. Fish. Soc.122(4): 616-628.
Aluminum	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1997. Baldigo, B.P., and P.S. Murdoch. Effect of Stream Acidification and Inorganic Aluminum on Mortality of Brook Trout (Salvelinus fontinalis) in the Catskill Mountains, New York. Can. J. Fish. Aquat. Sci.54: 603-615.
Aluminum	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	320	NA	NR	ug/L	LAB	1980. Schofield, C.L., and J.R. Trojnar. Aluminum Toxicity to Brook Trout (Salvelinus fontinalis) in Acidified Waters. Environ. Sci. Res.17: 341-366.
Aluminum	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	268	NA	NR	ug/L	LAB	1991. Cleveland, L., D.R. Buckler, and W.G. Brumbaugh. Residue Dynamics and Effects of Aluminum on Growth and Mortality in Brook Trout. Environ. Toxicol. Chem.10(2): 243-248.
Aluminum chloride (AlCl3)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Baker, J.P., and C.L. Schofield. Aluminum Toxicity to Fish in Acidic Waters. Water Air Soil Pollut.18: 289-309.
Aluminum chloride (AlCl3)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Baker, J.P., and C.L. Schofield. Aluminum Toxicity to Fish in Acidic Waters. Water Air Soil Pollut.18: 289-309.
Aluminum chloride (AlCl3)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Baker, J.P., and C.L. Schofield. Aluminum Toxicity to Fish in Acidic Waters. Water Air Soil Pollut.18: 289-309.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1986. Cleveland, L., E.E. Little, S.J. Hamilton, D.R. Buckler, and J.B. Hunn. Interactive Toxicity of Aluminum and Acidity to Early Life Stages of Brook Trout. Trans. Am. Fish. Soc.115: 610-620.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1986. Cleveland, L., E.E. Little, S.J. Hamilton, D.R. Buckler, and J.B. Hunn. Interactive Toxicity of Aluminum and Acidity to Early Life Stages of Brook Trout. Trans. Am. Fish. Soc.115: 610-620.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1986. Cleveland, L., E.E. Little, S.J. Hamilton, D.R. Buckler, and J.B. Hunn. Interactive Toxicity of Aluminum and Acidity to Early Life Stages of Brook Trout. Trans. Am. Fish. Soc.115: 610-620.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1986. Cleveland, L., E.E. Little, S.J. Hamilton, D.R. Buckler, and J.B. Hunn. Interactive Toxicity of Aluminum and Acidity to Early Life Stages of Brook Trout. Trans. Am. Fish. Soc.115: 610-620.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1986. Cleveland, L., E.E. Little, S.J. Hamilton, D.R. Buckler, and J.B. Hunn. Interactive Toxicity of Aluminum and Acidity to Early Life Stages of Brook Trout. Trans. Am. Fish. Soc.115: 610-620.
Sulfuric acid, Aluminum salt (3:2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	283	NA	NR	ug/L	LAB	1987. Hunn, J.B., L. Cleveland, and E.E. Little. Influence of pH and Aluminum on Developing Brook Trout in a Low Calcium Water. Environ. Pollut.43(1): 63-73.
Aluminum	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	320	NA	NR	ug/L	LAB	1980. Schofield, C.L., and J.R. Trojnar. Aluminum Toxicity to Brook Trout (Salvelinus fontinalis) in Acidified Waters. Environ. Sci. Res.17: 341-366.
Aluminum	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	320	NA	NR	ug/L	LAB	1980. Schofield, C.L., and J.R. Trojnar. Aluminum Toxicity to Brook Trout (Salvelinus fontinalis) in Acidified Waters. Environ. Sci. Res.17: 341-366.
Aluminum	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	320	NA	NR	ug/L	LAB	1980. Schofield, C.L., and J.R. Trojnar. Aluminum Toxicity to Brook Trout (Salvelinus fontinalis) in Acidified Waters. Environ. Sci. Res.17: 341-366.
Aluminum chloride (AlCl3)	Brown Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1986. Sadler, K., and A.W.H. Turnpenny. Field and Laboratory Studies of Exposures of Brown Trout to Acid Waters. Water Air Soil Pollut.30: 593-599.
NR	Brown Trout	Fish	Fresh	Mortality	LC27		I	108			ug/L	LAB	1988. Reader et al. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NA	NR	ug/L	FIELDN	1990. Weatherley, N.S., A.P. Rogers, X. Goenaga, and S.J. Ormerod. The Survival of Early Life Stages of Brown Trout (Salmo trutta L.) in Relation to Aluminium Speciation in Upland Welsh Streams. Aquat. Toxicol.17(3): 213-230.
Aluminum	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	FIELDN	1990. Weatherley, N.S., A.P. Rogers, X. Goenaga, and S.J. Ormerod. The Survival of Early Life Stages of Brown Trout (Salmo trutta L.) in Relation to Aluminium Speciation in Upland Welsh Streams. Aquat. Toxicol.17(3): 213-230.
Aluminum	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	79	NA	NR	ug/L	FIELDN	1990. Weatherley, N.S., A.P. Rogers, X. Goenaga, and S.J. Ormerod. The Survival of Early Life Stages of Brown Trout (Salmo trutta L.) in Relation to Aluminium Speciation in Upland Welsh Streams. Aquat. Toxicol.17(3): 213-230.
Aluminum	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	FIELDN	1990. Weatherley, N.S., A.P. Rogers, X. Goenaga, and S.J. Ormerod. The Survival of Early Life Stages of Brown Trout (Salmo trutta L.) in Relation to Aluminium Speciation in Upland Welsh Streams. Aquat. Toxicol.17(3): 213-230.
Aluminum	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	72	NA	NR	ug/L	FIELDN	1990. Weatherley, N.S., A.P. Rogers, X. Goenaga, and S.J. Ormerod. The Survival of Early Life Stages of Brown Trout (Salmo trutta L.) in Relation to Aluminium Speciation in Upland Welsh Streams. Aquat. Toxicol.17(3): 213-230.
Aluminum	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	D	NR	ug/L	FIELDN	1993. Norrgren, L., and E. Degerman. Effects of Different Water Qualities on the Early Development of Atlantic Salmon and Brown Trout Exposed In Situ. Ambio22(4): 213-218.
Aluminum	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1990. Weatherley, N.S., A.P. Rogers, X. Goenaga, and S.J. Ormerod. The Survival of Early Life Stages of Brown Trout (Salmo trutta L.) in Relation to Aluminium Speciation in Upland Welsh Streams. Aquat. Toxicol.17(3): 213-230.
Aluminum	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDN	1991. Segner, H., H. Gebhardt, M. Linnenbach, R. Marthaler, and A. Ness. Influence of Low pH on Brown Trout, Salmo trutta. Verh. Int. Ver. Limnol.24: 2470-2473.
Aluminum	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	D	NR	ug/L	FIELDN	1993. Norrgren, L., and E. Degerman. Effects of Different Water Qualities on the Early Development of Atlantic Salmon and Brown Trout Exposed In Situ. Ambio22(4): 213-218.
Aluminum chloride (AlCl3)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1996. Witters, H.E., S. Van Puymbroeck, A.J.H. Stouthart, and S.E. Wendelaar Bonga. Physicochemical Changes of Aluminium in Mixing Zones: Mortality and Physiological Disturbances in Brown Trout (Salmo trutta L.). Environ. Toxicol. Chem.15(6): 986-996.
Aluminum chloride (AlCl3)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Effects of Six Trace Metals on Calcium Fluxes in Brown Trout (Salmo trutta L.) in Soft Water. J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.: 537-542.
Aluminum chloride (AlCl3)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1986. Sadler, K., and A.W.H. Turnpenny. Field and Laboratory Studies of Exposures of Brown Trout to Acid Waters. Water Air Soil Pollut.30: 593-599.
Aluminum chloride (AlCl3)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6030	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Embryonic and Larval Development of Brown Trout, Salmo trutta L.: Exposure to Trace Metal Mixtures in Soft Water. J. Fish Biol.38: 773-787.
Aluminum chloride (AlCl3)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1983. Brown, D.J.A.. Effect of Calcium and Aluminum Concentrations on the Survival of Brown Trout (Salmo trutta) at Low pH. Bull. Environ. Contam. Toxicol.30(5): 582-587.
Sulfuric acid, Aluminum salt (3:2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Segner, H., H. Gebhardt, M. Linnenbach, R. Marthaler, and A. Ness. Influence of Low pH on Brown Trout, Salmo trutta. Verh. Int. Ver. Limnol.24: 2470-2473.
Sulfuric acid, Aluminum salt (3:2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Waring, C.P., and J.A. Brown. Ionoregulatory and Respiratory Responses of Brown Trout, Salmo trutta, Exposed to Lethal and Sublethal Aluminium in Acidic Soft Waters. Fish Physiol. Biochem.14(1): 81-91.
Sulfuric acid, Aluminum salt (3:2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	L	NR	ug/L	LAB	1991. Segner, H., H. Gebhardt, M. Linnenbach, R. Marthaler, and A. Ness. Influence of Low pH on Brown Trout, Salmo trutta. Verh. Int. Ver. Limnol.24: 2470-2473.
Aluminum chloride (AlCl3)	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	6600	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Embryonic and Larval Development of Brown Trout, Salmo trutta L.: Exposure to Trace Metal Mixtures in Soft Water. J. Fish Biol.38: 773-787.
Aluminum chloride, Basic	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Sulfuric acid, Aluminum salt (3:2)	Cisco	Fish	Fresh	Growth	NR	Whole Organism	T	NR	L	NR	ug/L	LAB	1993. Vuorinen, M., P.J. Vuorinen, J. Hoikka, and S. Peuranen. Lethal and Sublethal Threshold Values of Aluminium and Acidity to Pike (Esox lucius), Whitefish (Coregonus lavaretus pallasi), Pike Perch. Sci. Total Environ.Suppl: 953-967.
Sulfuric acid, Aluminum salt (3:2)	Cisco	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Vuorinen, M., P.J. Vuorinen, J. Hoikka, and S. Peuranen. Lethal and Sublethal Threshold Values of Aluminium and Acidity to Pike (Esox lucius), Whitefish (Coregonus lavaretus pallasi), Pike Perch. Sci. Total Environ.Suppl: 953-967.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Cisco	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Vuorinen, M., P.J. Vuorinen, J. Hoikka, and S. Peuranen. Lethal and Sublethal Threshold Values of Aluminium and Acidity to Pike (Esox lucius), Whitefish (Coregonus lavaretus pallasi), Pike Perch. Sci. Total Environ.Suppl: 953-967.
Sulfuric acid, Aluminum salt (3:2)	Cisco	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Vuorinen, M., P.J. Vuorinen, J. Hoikka, and S. Peuranen. Lethal and Sublethal Threshold Values of Aluminium and Acidity to Pike (Esox lucius), Whitefish (Coregonus lavaretus pallasi), Pike Perch. Sci. Total Environ.Suppl: 953-967.
Aluminum chloride, Basic	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Aluminum chloride (AlCl3)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Aluminum chloride (AlCl3)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	8000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Aluminum chloride (AlCl3)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	8000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Aluminum chloride (AlCl3)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Aluminum chloride (AlCl3)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Aluminum chloride (AlCl3)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	8000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Sulfuric acid, Aluminum salt (3:2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	8000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Sulfuric acid, Aluminum salt (3:2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	8000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Sulfuric acid, Aluminum salt (3:2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Sulfuric acid, Aluminum salt (3:2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Sulfuric acid, Aluminum salt (3:2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Sulfuric acid, Aluminum salt (3:2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	8000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Aluminum Chloride and Sulfate to Fish at High Concentrations. Bull. Environ. Contam. Toxicol.27(2): 221-225.
Aluminum nitrate	Crucian Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	402	D	294	ug/L	LAB	1995. Poleo, A.B.S., S.A. Oxneyad, K. Ostbye, R.A. Andersen, D.H. Oughton, and L.A. Vollestad. Survival of Crucian Carp, Carassius carassius, Exposed to a high Low-Molecular Weight Inorganic Aluminium Challenge. Aquat. Sci.57(4): 350-359.
Sulfuric acid, Aluminum salt (3:2)	Cutthroat Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Woodward, D.F., A.M. Farag, M.E. Mueller, E.E. Little, and F.A. Vertucci. Sensitivity of Endemic Snake River Cutthroat Trout to Acidity and Elevated Aluminum. Trans. Am. Fish. Soc.118(3): 630-643.
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	7100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	7100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	5800	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	5800	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	4700	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	4700	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Aluminum chloride (AlCl3)	Fathead Minnow	Fish	Fresh	Growth	NR		T	66	D	35	ug/L	LAB	1989. McCormick, J.H., K.M. Jensen, and L.E. Anderson. Chronic Effects of Low pH and Elevated Aluminum on Survival, Maturation, Spawning and Embryo-Larval Development of the Fathead Minnow in Soft Water. Water Air Soil Pollut.43(3-4): 293-307.
Aluminum nitrate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4250	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	33900	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	36100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4400	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19300	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	25500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	1190	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	9200	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Aluminum chloride (AlCl3)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Palmer, R.E., R.J. Klauda, M.A. Jepson, and E.S. Perry. Acute Sensitivity of Early Life Stages of Fathead Minnow (Pimephales promelas) to Acid and Aluminum. Water Res.23(8): 1039-1047.
Aluminum chloride (AlCl3)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Palmer, R.E., R.J. Klauda, M.A. Jepson, and E.S. Perry. Acute Sensitivity of Early Life Stages of Fathead Minnow (Pimephales promelas) to Acid and Aluminum. Water Res.23(8): 1039-1047.
Aluminum chloride (AlCl3)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Palmer, R.E., R.J. Klauda, M.A. Jepson, and E.S. Perry. Acute Sensitivity of Early Life Stages of Fathead Minnow (Pimephales promelas) to Acid and Aluminum. Water Res.23(8): 1039-1047.
Aluminum chloride (AlCl3)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	66	D	35	ug/L	LAB	1989. McCormick, J.H., K.M. Jensen, and L.E. Anderson. Chronic Effects of Low pH and Elevated Aluminum on Survival, Maturation, Spawning and Embryo-Larval Development of the Fathead Minnow in Soft Water. Water Air Soil Pollut.43(3-4): 293-307.
Aluminum chloride (AlCl3)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	66	D	35	ug/L	LAB	1989. McCormick, J.H., K.M. Jensen, and L.E. Anderson. Chronic Effects of Low pH and Elevated Aluminum on Survival, Maturation, Spawning and Embryo-Larval Development of the Fathead Minnow in Soft Water. Water Air Soil Pollut.43(3-4): 293-307.
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	53800	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	23100	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Aluminum salt (3:2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Boyd, C.E.. Aluminum Sulfate (Alum) for Precipitating Clay Turbidity from Fish Ponds. Trans. Am. Fish. Soc.108: 307-313.
Aluminum chloride (AlCl3)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	66	D	35	ug/L	LAB	1989. McCormick, J.H., K.M. Jensen, and L.E. Anderson. Chronic Effects of Low pH and Elevated Aluminum on Survival, Maturation, Spawning and Embryo-Larval Development of the Fathead Minnow in Soft Water. Water Air Soil Pollut.43(3-4): 293-307.
Sulfuric acid, Aluminum salt (3:2)	Golden Shiner	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1986. Robinson, J.W., and P.M. Deano. Acid Rain: The Effects of pH, Aluminum, and Leaf Decomposition Products on Fish Survival. Am. Lab. (Shelton)18(7): 17-26.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Golden Shiner	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1986. Robinson, J.W., and P.M. Deano. Acid Rain: The Effects of pH, Aluminum, and Leaf Decomposition Products on Fish Survival. Am. Lab. (Shelton)18(7): 17-26.
Aluminum	Golden Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. DeLonay, A.J., E.E. Little, D.F. Woodward, W.G. Brumbaugh, A.M. Farag, and C.F. Rabeni. Sensitivity of Early-Life-Stage Golden Trout to Low pH and Elevated Aluminum. Environ. Toxicol. Chem.12: 1223-1232.
Sulfuric acid, Aluminum salt (3:2)	Golden Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. DeLonay, A.J.. The Effects of Low pH and Elevated Aluminum on Survival, Growth, Ionic Composition, and Behavior of Early Life Stages of Golden Trout. M.S.Thesis, University of Missouri-Columbia, Columbia, MO: 78 p..
Sulfuric acid, Aluminum salt (3:2)	Golden Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. DeLonay, A.J.. The Effects of Low pH and Elevated Aluminum on Survival, Growth, Ionic Composition, and Behavior of Early Life Stages of Golden Trout. M.S.Thesis, University of Missouri-Columbia, Columbia, MO: 78 p..
Sulfuric acid, Aluminum salt (3:2)	Golden Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. DeLonay, A.J.. The Effects of Low pH and Elevated Aluminum on Survival, Growth, Ionic Composition, and Behavior of Early Life Stages of Golden Trout. M.S.Thesis, University of Missouri-Columbia, Columbia, MO: 78 p..
Aluminum	Golden Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. DeLonay, A.J., E.E. Little, D.F. Woodward, W.G. Brumbaugh, A.M. Farag, and C.F. Rabeni. Sensitivity of Early-Life-Stage Golden Trout to Low pH and Elevated Aluminum. Environ. Toxicol. Chem.12: 1223-1232.
Sulfuric acid, Aluminum salt (3:2)	Golden Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. DeLonay, A.J.. The Effects of Low pH and Elevated Aluminum on Survival, Growth, Ionic Composition, and Behavior of Early Life Stages of Golden Trout. M.S.Thesis, University of Missouri-Columbia, Columbia, MO: 78 p..
Sulfuric acid, Aluminum salt (3:2)	Golden Trout	Fish	Fresh	Mortality	NR	Not Reported	T	295	NA	NR	ug/L	LAB	1991. DeLonay, A.J.. The Effects of Low pH and Elevated Aluminum on Survival, Growth, Ionic Composition, and Behavior of Early Life Stages of Golden Trout. M.S.Thesis, University of Missouri-Columbia, Columbia, MO: 78 p..
Sulfuric acid, Aluminum salt (3:2)	Golden Trout	Fish	Fresh	Mortality	NR	Not Reported	T	295	NA	NR	ug/L	LAB	1991. DeLonay, A.J.. The Effects of Low pH and Elevated Aluminum on Survival, Growth, Ionic Composition, and Behavior of Early Life Stages of Golden Trout. M.S.Thesis, University of Missouri-Columbia, Columbia, MO: 78 p..
Aluminum	Golden Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	293	NA	NR	ug/L	LAB	1993. DeLonay, A.J., E.E. Little, D.F. Woodward, W.G. Brumbaugh, A.M. Farag, and C.F. Rabeni. Sensitivity of Early-Life-Stage Golden Trout to Low pH and Elevated Aluminum. Environ. Toxicol. Chem.12: 1223-1232.
Sulfuric acid, Aluminum salt (3:2)	Golden Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	293	NA	NR	ug/L	LAB	1991. DeLonay, A.J.. The Effects of Low pH and Elevated Aluminum on Survival, Growth, Ionic Composition, and Behavior of Early Life Stages of Golden Trout. M.S.Thesis, University of Missouri-Columbia, Columbia, MO: 78 p..
Sulfuric acid, Aluminum salt (3:2)	Golden Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. DeLonay, A.J.. The Effects of Low pH and Elevated Aluminum on Survival, Growth, Ionic Composition, and Behavior of Early Life Stages of Golden Trout. M.S.Thesis, University of Missouri-Columbia, Columbia, MO: 78 p..
Aluminum	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Aluminum chloride (AlCl3)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Sulfuric acid, Aluminum salt (3:2)	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Sulfuric acid, Aluminum salt (3:2)	Goldfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Aluminum	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Grass Carp, White Amur	Fish	Fresh	Mortality	LETC	Not Reported	T	100	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Lake Trout, Siscowet	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1984. Gunn, J.M., and W. Keller. Spawning Site Water Chemistry and Lake Trout (Salvelinus namaycush) Sac Fry Survival During Spring Snow Melt. Can. J. Fish. Aquat. Sci.41: 319-329.
Aluminum chloride (AlCl3)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Aluminum	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	29.2	NR	NR	ug/L	LAB	1993. Leino, R.L., and J.H. McCormick. Response of Juvenile Largemouth Bass to Different pH and Aluminium Levels at Overwintering Temperatures: Effects on Gill Morphology, Electrolyte. Can. J. Zool.71(3): 531-543.
Aluminum chloride (AlCl3)	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1992. McCormick, J.H., and K.M. Jensen. Osmoregulatory Failure and Death of First-Year Largemouth Bass (Micropterus salmoides) Exposed to Low pH and Elevated Aluminum, at Low Temperature in. Can. J. Fish. Aquat. Sci.49(6): 1189-1197.
Aluminum chloride (AlCl3)	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	54.3	F	NR	ug/L	LAB	1992. McCormick, J.H., and K.M. Jensen. Osmoregulatory Failure and Death of First-Year Largemouth Bass (Micropterus salmoides) Exposed to Low pH and Elevated Aluminum, at Low Temperature in. Can. J. Fish. Aquat. Sci.49(6): 1189-1197.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Largemouth Bass	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Sulfuric acid, Aluminum salt (3:2)	Largemouth Bass	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Aluminum	Loach Family	Fish	Fresh	Mortality	LC50	Not Reported	T	1130	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	LC50	Not Reported	T	1970	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	LC50	Not Reported	T	2050	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	LC50	Not Reported	T	4690	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	LC50	Not Reported	T	4850	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	LC50	Not Reported	T	5200	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	12800	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	12800	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	12800	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3200	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3200	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3200	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1600	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3200	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3200	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	400	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	400	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Loach Family	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	400	NA	NR	ug/L	LAB	1992. Li, X., and F. Zhang. Toxic Effects of Low pH and Elevated Al Concentration on Early Life Stages of Several Species of Freshwater Fishes. Huanjing Kexue Xuebao12(1): 97-104.
Aluminum	Mottled Sculpin	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1993. Gagen, C.J., W.E. Sharpe, and R.F. Carline. Mortality of Brook Trout, Mottled Sculpins, and Slimy Sculpins During Acidic Episodes. Trans. Am. Fish. Soc.122(4): 616-628.
Sulfuric acid, Aluminum salt (3:2)	Mummichog	Fish	Fresh	Mortality	LC100	Not Reported	T	2200*	NA	NR	ug/L	LAB	1915. Thomas, A.. Effects of Certain Metallic Salts upon Fishes. Trans. Am. Fish. Soc.44: 120-124.
Sulfuric acid, Aluminum salt (3:2)	Mummichog	Fish	Fresh	Mortality	LC100	Not Reported	T	1100*	NA	NR	ug/L	LAB	1915. Thomas, A.. Effects of Certain Metallic Salts upon Fishes. Trans. Am. Fish. Soc.44: 120-124.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	NR	L	NR	ug/L	LAB	1993. Vuorinen, M., P.J. Vuorinen, J. Hoikka, and S. Peuranen. Lethal and Sublethal Threshold Values of Aluminium and Acidity to Pike (Esox lucius), Whitefish (Coregonus lavaretus pallasi), Pike Perch. Sci. Total Environ.Suppl: 953-967.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	300	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	600	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Yolk	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Yolk	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Yolk	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Yolk	T	300	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Yolk	T	300	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Yolk	T	600	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Yolk	T	600	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	300	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	600	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Vuorinen, M., P.J. Vuorinen, J. Hoikka, and S. Peuranen. Lethal and Sublethal Threshold Values of Aluminium and Acidity to Pike (Esox lucius), Whitefish (Coregonus lavaretus pallasi), Pike Perch. Sci. Total Environ.Suppl: 953-967.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Vuorinen, M., P.J. Vuorinen, J. Hoikka, and S. Peuranen. Lethal and Sublethal Threshold Values of Aluminium and Acidity to Pike (Esox lucius), Whitefish (Coregonus lavaretus pallasi), Pike Perch. Sci. Total Environ.Suppl: 953-967.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Vuorinen, P.J., M. Rask, M. Vuorinen, S. Peuranen, and J. Raitaniemi. The Sensitivity to Acidification of Pike (Esox lucius), Whitefish (Coregonus lavaretus) and Roach (Rutilus rutilus): Comparison of Field and Laboratory Studies. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 25, Fishing News Books, London: 283-293.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Northern Pike	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Aluminum chloride, Basic	Northern Squawfish	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	1436	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	166	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	661	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	766	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	1020	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	454	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	766	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	88	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	329	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	648	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	674	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	68	NA	NR	ug/L	LAB	1994. Vuorinen, M., P.J. Vuorinen, M. Rask, and J. Suomela. The Sensitivity to Acidity and Aluminium of Newly-Hatched Perch (Perca fluviatilis) Originating from Strains from Four Lakes with Different Degrees. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 24, Fishing News Books, London: 273-282.
Sulfuric acid, Aluminum salt (3:2)	Pollan, Whitefish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Vuorinen, P.J., M. Rask, M. Vuorinen, S. Peuranen, and J. Raitaniemi. The Sensitivity to Acidification of Pike (Esox lucius), Whitefish (Coregonus lavaretus) and Roach (Rutilus rutilus): Comparison of Field and Laboratory Studies. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 25, Fishing News Books, London: 283-293.
Sulfuric acid, Aluminum salt (3:2)	Pollan, Whitefish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Keinanen, M., S. Peuranen, C. Tigerstedt, and P.J. Vuorinen. Ion Regulation in Whitefish (Coregonus lavaretus L.) Yolk-Sac Fry Exposed to Low pH and Aluminum at Low and Moderate Ionic Strength. Ecotoxicol. Environ. Saf.40(1-2): 166-172.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Pollan, Whitefish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	200	NA	NR	ug/L	LAB	1994. Vuorinen, P.J., M. Rask, M. Vuorinen, S. Peuranen, and J. Raitaniemi. The Sensitivity to Acidification of Pike (Esox lucius), Whitefish (Coregonus lavaretus) and Roach (Rutilus rutilus): Comparison of Field and Laboratory Studies. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 25, Fishing News Books, London: 283-293.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	31.4	NR	NR	ug/L	LAB	1992. Wilson, R.W., and C.M. Wood. Swimming Performance, Whole Body Ions, and Gill A1 Accumulation During Acclimation to Sublethal Aluminium in Juvenile Rainbow Trout (Oncorhynchus mykiss). Fish Physiol. Biochem.10(2): 149-159.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	D	NR	ug/L	LAB	1994. Gundersen, D.T., S. Bustaman, W.K. Seim, and L.R. Curtis. pH, Hardness, and Humic Acid Influence Aluminum Toxicity to Rainbow Trout (Oncorhynchus mykiss) in Weakly Alkaline Waters. Can. J. Fish. Aquat. Sci.51: 1345-1355.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	38.1	NA	NR	ug/L	LAB	1994. Wilson, R.W., H.L. Bergman, and C.M. Wood. Metabolic Costs and Physiological Consequences of Acclimation to Aluminum in Juvenile Rainbow Trout (Oncorhynchus mykiss). 1: Acclimation Specificity, Resting Physiology, Feeding, and Growth. Can. J. Fish. Aquat. Sci.51: 527-535.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1984. Staurnes, M., T. Sigholt, and O.B. Reite. Reduced Carbonic Anhydrase and Na-K-ATPase Activity in Gills of Salmonids Exposed to Aluminium-Containing Acid Water. Experientia40: 226-227.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1971. Freeman, R.A., and W.H. Everhart. Toxicity of Aluminum Hydroxide Complexes in Neutral and Basic Media to Rainbow Trout. Trans. Am. Fish. Soc.100(4): 644-658.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	29.6	NR	NR	ug/L	LAB	1996. Wilson, R.W., C.M. Wood, and D.F. Houlihan. Growth and Protein Turnover During Acclimation to Acid and Aluminum in Juvenile Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.53(4): 802-811.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	29.6	NR	NR	ug/L	LAB	1996. Wilson, R.W., C.M. Wood, and D.F. Houlihan. Growth and Protein Turnover During Acclimation to Acid and Aluminum in Juvenile Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.53(4): 802-811.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1973. Everhart, W.H., and R.A. Freeman. Effects of Chemical Variations in Aquatic Environments. Vol. II. Toxic Effects of Aqueous Aluminum to Rainbow Trout. EPA/R3-73-011B, U.S.EPA, Washington, DC: 46 p..
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	70	NA	NR	ug/L	FIELDN	1983. Lamb, D.S., and G.C. Bailey. Effects of Aluminum Sulfate to Midge Larvae (Diptera: Chironomidae) and Rainbow Trout (Salmo Gairdneri). EPA 440/5-83-001, Lake Restoration, Protection and Management: 307-312.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	LC0	Not Reported	T	50000	NA	NR	ug/L	LAB	1980. Hunter, J.B., S.L. Ross, and J. Tannahill. Aluminum Pollution and Fish Toxicity. J. Water Pollut. Control Fed.79(3): 413-420.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	LC0	Not Reported	T	200000	NA	NR	ug/L	LAB	1980. Hunter, J.B., S.L. Ross, and J. Tannahill. Aluminum Pollution and Fish Toxicity. J. Water Pollut. Control Fed.79(3): 413-420.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	LC100	Not Reported	T	50000	NA	NR	ug/L	LAB	1980. Hunter, J.B., S.L. Ross, and J. Tannahill. Aluminum Pollution and Fish Toxicity. J. Water Pollut. Control Fed.79(3): 413-420.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	LC100	Not Reported	T	50000	NA	NR	ug/L	LAB	1980. Hunter, J.B., S.L. Ross, and J. Tannahill. Aluminum Pollution and Fish Toxicity. J. Water Pollut. Control Fed.79(3): 413-420.
Aluminum	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Aluminum	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	1983. Holtze, K.E.. Effects of pH and Ionic Strength on Aluminum Toxicity to Early Developmental Stages of Rainbow Trout (Salmo gairdneri Richardson). Res.Rep., Ontario Ministry of the Environment, Rexdale, Ont., Canada: 39 p..
Aluminum	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	1983. Holtze, K.E.. Effects of pH and Ionic Strength on Aluminum Toxicity to Early Developmental Stages of Rainbow Trout (Salmo gairdneri Richardson). Res.Rep., Ontario Ministry of the Environment, Rexdale, Ont., Canada: 39 p..
Aluminum	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	310	NR	NR	ug/L	LAB	1983. Holtze, K.E.. Effects of pH and Ionic Strength on Aluminum Toxicity to Early Developmental Stages of Rainbow Trout (Salmo gairdneri Richardson). Res.Rep., Ontario Ministry of the Environment, Rexdale, Ont., Canada: 39 p..
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13400	NA	NR	ug/L	LAB	1984. Call, D.J., L.T. Brooke, C.A. Lindberg, T.P. Markee, D.J. McCauley, and S.H. Poirier. Toxicity of Aluminum to Freshwater Organisms in Water of pH 6.5-8.5. Tech.Rep.Project No.549-238-RT-WRD, Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI/November 27, 1984 Memo to C.Stephan, U.S.EPA, Duluth, MN: 46 p..
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1940	D	430	ug/L	LAB	1994. Gundersen, D.T., S. Bustaman, W.K. Seim, and L.R. Curtis. pH, Hardness, and Humic Acid Influence Aluminum Toxicity to Rainbow Trout (Oncorhynchus mykiss) in Weakly Alkaline Waters. Can. J. Fish. Aquat. Sci.51: 1345-1355.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3910	D	670	ug/L	LAB	1994. Gundersen, D.T., S. Bustaman, W.K. Seim, and L.R. Curtis. pH, Hardness, and Humic Acid Influence Aluminum Toxicity to Rainbow Trout (Oncorhynchus mykiss) in Weakly Alkaline Waters. Can. J. Fish. Aquat. Sci.51: 1345-1355.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10500	NA	NR	ug/L	LAB	1984. Call, D.J., L.T. Brooke, C.A. Lindberg, T.P. Markee, D.J. McCauley, and S.H. Poirier. Toxicity of Aluminum to Freshwater Organisms in Water of pH 6.5-8.5. Tech.Rep.Project No.549-238-RT-WRD, Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI/November 27, 1984 Memo to C.Stephan, U.S.EPA, Duluth, MN: 46 p..
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9700	NA	NR	ug/L	LAB	1984. Call, D.J., L.T. Brooke, C.A. Lindberg, T.P. Markee, D.J. McCauley, and S.H. Poirier. Toxicity of Aluminum to Freshwater Organisms in Water of pH 6.5-8.5. Tech.Rep.Project No.549-238-RT-WRD, Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI/November 27, 1984 Memo to C.Stephan, U.S.EPA, Duluth, MN: 46 p..
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6170	D	610	ug/L	LAB	1994. Gundersen, D.T., S. Bustaman, W.K. Seim, and L.R. Curtis. pH, Hardness, and Humic Acid Influence Aluminum Toxicity to Rainbow Trout (Oncorhynchus mykiss) in Weakly Alkaline Waters. Can. J. Fish. Aquat. Sci.51: 1345-1355.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6170	D	570	ug/L	LAB	1994. Gundersen, D.T., S. Bustaman, W.K. Seim, and L.R. Curtis. pH, Hardness, and Humic Acid Influence Aluminum Toxicity to Rainbow Trout (Oncorhynchus mykiss) in Weakly Alkaline Waters. Can. J. Fish. Aquat. Sci.51: 1345-1355.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6930	D	670	ug/L	LAB	1994. Gundersen, D.T., S. Bustaman, W.K. Seim, and L.R. Curtis. pH, Hardness, and Humic Acid Influence Aluminum Toxicity to Rainbow Trout (Oncorhynchus mykiss) in Weakly Alkaline Waters. Can. J. Fish. Aquat. Sci.51: 1345-1355.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7670	D	730	ug/L	LAB	1994. Gundersen, D.T., S. Bustaman, W.K. Seim, and L.R. Curtis. pH, Hardness, and Humic Acid Influence Aluminum Toxicity to Rainbow Trout (Oncorhynchus mykiss) in Weakly Alkaline Waters. Can. J. Fish. Aquat. Sci.51: 1345-1355.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8600	NA	NR	ug/L	LAB	1984. Call, D.J., L.T. Brooke, C.A. Lindberg, T.P. Markee, D.J. McCauley, and S.H. Poirier. Toxicity of Aluminum to Freshwater Organisms in Water of pH 6.5-8.5. Tech.Rep.Project No.549-238-RT-WRD, Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI/November 27, 1984 Memo to C.Stephan, U.S.EPA, Duluth, MN: 46 p..
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	88	NR	NR	ug/L	LAB	1993. Hickie, B.E., N.J. Hutchinson, D.G. Dixon, and P.V. Hodson. Toxicity of Trace Metal Mixtures to Alevin Rainbow Trout (Oncorhynchus mykiss) and Larval Fathead Minnow (Pimephales promelas) in Soft, Acidic Water. Can. J. Fish. Aquat. Sci.50: 1348-1355.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	91	NR	NR	ug/L	LAB	1993. Hickie, B.E., N.J. Hutchinson, D.G. Dixon, and P.V. Hodson. Toxicity of Trace Metal Mixtures to Alevin Rainbow Trout (Oncorhynchus mykiss) and Larval Fathead Minnow (Pimephales promelas) in Soft, Acidic Water. Can. J. Fish. Aquat. Sci.50: 1348-1355.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	175	NA	NR	ug/L	LAB	1986. Orr, P.L., R.W. Bradley, J.B. Sprague, and N.J. Hutchinson. Acclimation-Induced Change in Toxicity of Aluminum to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43: 243-246.
Aluminum sulfate	Rainbow Trout	Fish	Fresh	Mortality	NOEC		T	50			ug/L	LAB	1988. Heming and Blumhagen. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum sulfate	Rainbow Trout	Fish	Fresh	Mortality	NOEC		T	91			ug/L	LAB	1988. Heming and Blumhagen. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1983. Holtze, K.E.. Effects of pH and Ionic Strength on Aluminum Toxicity to Early Developmental Stages of Rainbow Trout (Salmo gairdneri Richardson). Res.Rep., Ontario Ministry of the Environment, Rexdale, Ont., Canada: 39 p..
Aluminum	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1983. Holtze, K.E.. Effects of pH and Ionic Strength on Aluminum Toxicity to Early Developmental Stages of Rainbow Trout (Salmo gairdneri Richardson). Res.Rep., Ontario Ministry of the Environment, Rexdale, Ont., Canada: 39 p..
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	29.6	NR	NR	ug/L	LAB	1996. Wilson, R.W., C.M. Wood, and D.F. Houlihan. Growth and Protein Turnover During Acclimation to Acid and Aluminum in Juvenile Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.53(4): 802-811.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	38.1	NA	NR	ug/L	LAB	1994. Wilson, R.W., H.L. Bergman, and C.M. Wood. Metabolic Costs and Physiological Consequences of Acclimation to Aluminum in Juvenile Rainbow Trout (Oncorhynchus mykiss). 1: Acclimation Specificity, Resting Physiology, Feeding, and Growth. Can. J. Fish. Aquat. Sci.51: 527-535.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Everhart, W.H., and R.A. Freeman. Effects of Chemical Variations in Aquatic Environments. Vol. II. Toxic Effects of Aqueous Aluminum to Rainbow Trout. EPA/R3-73-011B, U.S.EPA, Washington, DC: 46 p..
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Everhart, W.H., and R.A. Freeman. Effects of Chemical Variations in Aquatic Environments. Vol. II. Toxic Effects of Aqueous Aluminum to Rainbow Trout. EPA/R3-73-011B, U.S.EPA, Washington, DC: 46 p..
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	L	NR	NA	NR	uM	LAB	1985. Neville, C.M.. Physiological Response of Juvenile Rainbow Trout, Salmo gairdneri, to Acid and Aluminum - Prediction of Field Responses from Laboratory Data. Can. J. Fish. Aquat. Sci.42: 2004-2019.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	70	NA	NR	ug/L	FIELDN	1983. Lamb, D.S., and G.C. Bailey. Effects of Aluminum Sulfate to Midge Larvae (Diptera: Chironomidae) and Rainbow Trout (Salmo Gairdneri). EPA 440/5-83-001, Lake Restoration, Protection and Management: 307-312.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	910	NA	NR	ug/L	LAB	1988. Heming, T.A., and K.A. Blumhagen. Plasma Acid-Base and Electrolyte States of Rainbow Trout Exposed to Alum (Aluminum Sulphate) in Acidic and Alkaline Environments. Aquat. Toxicol.12(2): 125-140.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	9100	NA	NR	ug/L	LAB	1988. Heming, T.A., and K.A. Blumhagen. Plasma Acid-Base and Electrolyte States of Rainbow Trout Exposed to Alum (Aluminum Sulphate) in Acidic and Alkaline Environments. Aquat. Toxicol.12(2): 125-140.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	910	NA	NR	ug/L	LAB	1988. Heming, T.A., and K.A. Blumhagen. Plasma Acid-Base and Electrolyte States of Rainbow Trout Exposed to Alum (Aluminum Sulphate) in Acidic and Alkaline Environments. Aquat. Toxicol.12(2): 125-140.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	910	NA	NR	ug/L	LAB	1988. Heming, T.A., and K.A. Blumhagen. Plasma Acid-Base and Electrolyte States of Rainbow Trout Exposed to Alum (Aluminum Sulphate) in Acidic and Alkaline Environments. Aquat. Toxicol.12(2): 125-140.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	90	NA	NR	ug/L	LAB	1988. Heming, T.A., and K.A. Blumhagen. Plasma Acid-Base and Electrolyte States of Rainbow Trout Exposed to Alum (Aluminum Sulphate) in Acidic and Alkaline Environments. Aquat. Toxicol.12(2): 125-140.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	910	NA	NR	ug/L	LAB	1988. Heming, T.A., and K.A. Blumhagen. Plasma Acid-Base and Electrolyte States of Rainbow Trout Exposed to Alum (Aluminum Sulphate) in Acidic and Alkaline Environments. Aquat. Toxicol.12(2): 125-140.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	50000	NA	NR	ug/L	LAB	1980. Hunter, J.B., S.L. Ross, and J. Tannahill. Aluminum Pollution and Fish Toxicity. J. Water Pollut. Control Fed.79(3): 413-420.
Aluminum	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	161.7	NA	NR	ug/L	LAB	1994. Wilson, R.W., H.L. Bergman, and C.M. Wood. Metabolic Costs and Physiological Consequences of Acclimation to Aluminum in Juvenile Rainbow Trout (Oncorhynchus mykiss). 1: Acclimation Specificity, Resting Physiology, Feeding, and Growth. Can. J. Fish. Aquat. Sci.51: 527-535.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	112	NR	NR	ug/L	LAB	1988. Goss, G.G., and C.M. Wood. The Effects of Acid and Acid/Aluminum Exposure on Circulating Plasma Cortisol Levels and Other Blood Parameters in the Rainbow Trout, Salmo gairdneri. J. Fish Biol.32(1): 63-76.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	9100	NA	NR	ug/L	LAB	1988. Heming, T.A., and K.A. Blumhagen. Plasma Acid-Base and Electrolyte States of Rainbow Trout Exposed to Alum (Aluminum Sulphate) in Acidic and Alkaline Environments. Aquat. Toxicol.12(2): 125-140.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	D	NR	ug/L	LAB	1994. Gundersen, D.T., S. Bustaman, W.K. Seim, and L.R. Curtis. pH, Hardness, and Humic Acid Influence Aluminum Toxicity to Rainbow Trout (Oncorhynchus mykiss) in Weakly Alkaline Waters. Can. J. Fish. Aquat. Sci.51: 1345-1355.
Aluminum chloride (AlCl3)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	D	NR	ug/L	LAB	1994. Gundersen, D.T., S. Bustaman, W.K. Seim, and L.R. Curtis. pH, Hardness, and Humic Acid Influence Aluminum Toxicity to Rainbow Trout (Oncorhynchus mykiss) in Weakly Alkaline Waters. Can. J. Fish. Aquat. Sci.51: 1345-1355.
Sulfuric acid, Aluminum salt (3:2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	70	NA	NR	ug/L	FIELDN	1983. Lamb, D.S., and G.C. Bailey. Effects of Aluminum Sulfate to Midge Larvae (Diptera: Chironomidae) and Rainbow Trout (Salmo Gairdneri). EPA 440/5-83-001, Lake Restoration, Protection and Management: 307-312.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Growth	NR	Whole Organism	T	NR	L	NR	ug/L	LAB	1993. Vuorinen, M., P.J. Vuorinen, J. Hoikka, and S. Peuranen. Lethal and Sublethal Threshold Values of Aluminium and Acidity to Pike (Esox lucius), Whitefish (Coregonus lavaretus pallasi), Pike Perch. Sci. Total Environ.Suppl: 953-967.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Growth	NR	Yolk	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Growth	NR	Yolk	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Growth	NR	Yolk	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Growth	NR	Yolk	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
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Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
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Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
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Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Vuorinen, P.J., M. Rask, M. Vuorinen, S. Peuranen, and J. Raitaniemi. The Sensitivity to Acidification of Pike (Esox lucius), Whitefish (Coregonus lavaretus) and Roach (Rutilus rutilus): Comparison of Field and Laboratory Studies. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 25, Fishing News Books, London: 283-293.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
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Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	200	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	400	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	400	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Roach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	2000. Keinanen, M., S. Peuranen, M. Nikinmaa, C. Tigerstedt, and P.J. Vuorinen. Comparison of the Responses of the Yolk-Sac Fry of Pike (Esox lucius) and Roach (Rutilus rutilus) to Low pH and Aluminium: Sodium Influx, Development and Activity. Aquat. Toxicol.47(3-4): 161-179.
Sulfuric acid, Aluminum salt (3:2)	Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	270	L	113	ug/L	FIELDA	1989. McCahon, C.P., and D. Pascoe. Short-Term Experimental Acidification of a Welsh Stream: Toxicity of Different Forms of Aluminium at Low pH to Fish and Invertebrates. Arch. Environ. Contam. Toxicol.18: 233-242.
Sulfuric acid, Aluminum salt (3:2)	Shiner	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	LAB	1992. Murungi, J.I., and J.W. Robinson. Uptake and Accumulation of Aluminum by Fish-The Modifying Effect of Added Ions. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control27(3): 713-719.
Aluminum	Slimy Sculpin	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1993. Gagen, C.J., W.E. Sharpe, and R.F. Carline. Mortality of Brook Trout, Mottled Sculpins, and Slimy Sculpins During Acidic Episodes. Trans. Am. Fish. Soc.122(4): 616-628.
Sulfuric acid, Aluminum salt (3:2)	Smallmouth Bass	Fish	Fresh	Growth	NR		T	251.6	NA	NR	ug/L	LAB	1987. Kane, D.A., and C.F. Rabeni. Effects of Aluminum and pH on the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Res.21(6): 633-639.
Sulfuric acid, Aluminum salt (3:2)	Smallmouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	251.6	NA	NR	ug/L	LAB	1987. Kane, D.A., and C.F. Rabeni. Effects of Aluminum and pH on the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Res.21(6): 633-639.
Sulfuric acid, Aluminum salt (3:2)	Smallmouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	196	NA	NR	ug/L	LAB	1987. Kane, D.A., and C.F. Rabeni. Effects of Aluminum and pH on the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Res.21(6): 633-639.
Sulfuric acid, Aluminum salt (3:2)	Smallmouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	217	NA	NR	ug/L	LAB	1987. Kane, D.A., and C.F. Rabeni. Effects of Aluminum and pH on the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Res.21(6): 633-639.
Sulfuric acid, Aluminum salt (3:2)	Smallmouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1987. Kane, D.A., and C.F. Rabeni. Effects of Aluminum and pH on the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Res.21(6): 633-639.
Sulfuric acid, Aluminum salt (3:2)	Smallmouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	32	NA	NR	ug/L	LAB	1987. Kane, D.A., and C.F. Rabeni. Effects of Aluminum and pH on the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Res.21(6): 633-639.
Sulfuric acid, Aluminum salt (3:2)	Smallmouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	320	NA	NR	ug/L	LAB	1987. Kane, D.A., and C.F. Rabeni. Effects of Aluminum and pH on the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Res.21(6): 633-639.
Sulfuric acid, Aluminum salt (3:2)	Smallmouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	56	NA	NR	ug/L	LAB	1987. Kane, D.A., and C.F. Rabeni. Effects of Aluminum and pH on the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Res.21(6): 633-639.
Sulfuric acid, Aluminum salt (3:2)	Smallmouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	560	NA	NR	ug/L	LAB	1987. Kane, D.A., and C.F. Rabeni. Effects of Aluminum and pH on the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Res.21(6): 633-639.
Aluminum	Striped Bass	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1985. Hall, L.W.,Jr., A.E. Pinkney, L.O. Horseman, and S.E. Finger. Mortality of Striped Bass Larvae in Relation to Contaminants and Water Quality in a Chesapeake Bay Tributary. Trans. Am. Fish. Soc.114(6): 861-868.
Sulfuric acid, Aluminum salt (3:2)	Striped Bass	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1987. Buckler, D.R., P.M. Mehrle, L. Cleveland, and F.J. Dwyer. Influence of pH on the Toxicity of Aluminum and Other Inorganic Contaminants to East Coast Striped Bass. Water Air Soil Pollut.35: 97-106.
Sulfuric acid, Aluminum salt (3:2)	Striped Bass	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	300	NA	NR	ug/L	LAB	1987. Buckler, D.R., P.M. Mehrle, L. Cleveland, and F.J. Dwyer. Influence of pH on the Toxicity of Aluminum and Other Inorganic Contaminants to East Coast Striped Bass. Water Air Soil Pollut.35: 97-106.
Aluminum nitrate	Threespine Stickleback	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	10000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Aluminum nitrate	Threespine Stickleback	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	70	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Aluminum chloride (AlCl3)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	29600*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Aluminum chloride (AlCl3)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	27500*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Aluminum chloride (AlCl3)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	27100*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Sulfuric acid, Aluminum salt (3:2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	69000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Sulfuric acid, Aluminum salt (3:2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	38000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Sulfuric acid, Aluminum salt (3:2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	37000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Aluminum chloride (AlCl3)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	20400*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Aluminum chloride (AlCl3)	White Sucker	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Baker, J.P., and C.L. Schofield. Aluminum Toxicity to Fish in Acidic Waters. Water Air Soil Pollut.18: 289-309.

Table C-1. Summary of Results from the EcoTox Database for Fish - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum chloride (AlCl3)	White Sucker	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Baker, J.P., and C.L. Schofield. Aluminum Toxicity to Fish in Acidic Waters. Water Air Soil Pollut.18: 289-309.
Aluminum chloride (AlCl3)	White Sucker	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Baker, J.P., and C.L. Schofield. Aluminum Toxicity to Fish in Acidic Waters. Water Air Soil Pollut.18: 289-309.
Aluminum chloride (AlCl3)	White Sucker	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Baker, J.P., and C.L. Schofield. Aluminum Toxicity to Fish in Acidic Waters. Water Air Soil Pollut.18: 289-309.
Aluminum chloride (AlCl3)	White Sucker	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Baker, J.P., and C.L. Schofield. Aluminum Toxicity to Fish in Acidic Waters. Water Air Soil Pollut.18: 289-309.
Sulfuric acid, Aluminum salt (3:2)	Zander	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	L	NR	ug/L	LAB	1993. Vuorinen, M., P.J. Vuorinen, J. Hoikka, and S. Peuranen. Lethal and Sublethal Threshold Values of Aluminium and Acidity to Pike (Esox lucius), Whitefish (Coregonus lavaretus pallasi), Pike Perch. Sci. Total Environ.Suppl: 953-967.
Sulfuric acid, Aluminum salt (3:2)	Zander	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Vuorinen, M., P.J. Vuorinen, J. Hoikka, and S. Peuranen. Lethal and Sublethal Threshold Values of Aluminium and Acidity to Pike (Esox lucius), Whitefish (Coregonus lavaretus pallasi), Pike Perch. Sci. Total Environ.Suppl: 953-967.
Sulfuric acid, Aluminum salt (3:2)	Zander	Fish	Fresh	Mortality	NR	Not Reported	T	400	NA	NR	ug/L	LAB	1975. Stangenberg, M.. The Influence of the Chemical Composition of Water on the Pike Perch (Lucioperca lucioperca L.) Fry from the Lake Gopio. Limnologica9(3): 421-426.
Aluminum chloride (AlCl3)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	D	7920	NR	NR	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Aluminum chloride (AlCl3)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	106000	NA	NR	ug/L	LAB	1985. Dave, G.. The Influence of pH on the Toxicity of Aluminum, Cadmium, and Iron to Eggs and Larvae of the Zebrafish, Brachydanio rerio. Ecotoxicol. Environ. Saf.10(2): 253-267.
Aluminum chloride (AlCl3)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	80000	NA	NR	ug/L	LAB	1985. Dave, G.. The Influence of pH on the Toxicity of Aluminum, Cadmium, and Iron to Eggs and Larvae of the Zebrafish, Brachydanio rerio. Ecotoxicol. Environ. Saf.10(2): 253-267.

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Table C-2. Summary of Results from the EcoTox Database for Fish - Antimony

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Antimony chloride	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Antimony trichloride	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Antimony chloride	Salmon,Silver S	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Antimony trichloride	Salmon,Silver S	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Antimony trichloride	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	2310	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	4500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	1620	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	3220	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trioxide	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	7.5	NA	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Antimony trioxide	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	7.5	NR	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Antimony trichloride	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	1130	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	2310	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	22700	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19300	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	17000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Antimony trichloride	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	9000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Antimony trichloride	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	9310	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	6740	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trioxide	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.5	NR	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Antimony trioxide	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.5	NA	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Antimony trichloride	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	4500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..

Table C-2. Summary of Results from the EcoTox Database for Fish - Antimony

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Antimony trichloride	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Antimony trichloride	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	11300	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Antimony trichloride	Mozambique Tilapia	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	T	NR	NR	NR	ug/L	LAB	1998. Lin, H.C., and P.P. Hwang. Acute and Chronic Effects of Antimony Chloride (SbCl3) on Tilapia (Oreochromis mossambicus) Larvae. Bull. Environ. Contam. Toxicol.61(1): 129-134.
Antimony trichloride	Mozambique Tilapia	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Lin, H.C., and P.P. Hwang. Acute and Chronic Effects of Antimony Chloride (SbCl3) on Tilapia (Oreochromis mossambicus) Larvae. Bull. Environ. Contam. Toxicol.61(1): 129-134.
Antimony trichloride	Mozambique Tilapia	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Lin, H.C., and P.P. Hwang. Acute and Chronic Effects of Antimony Chloride (SbCl3) on Tilapia (Oreochromis mossambicus) Larvae. Bull. Environ. Contam. Toxicol.61(1): 129-134.
Antimony trichloride	Mozambique Tilapia	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Lin, H.C., and P.P. Hwang. Acute and Chronic Effects of Antimony Chloride (SbCl3) on Tilapia (Oreochromis mossambicus) Larvae. Bull. Environ. Contam. Toxicol.61(1): 129-134.
Antimony trichloride	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	35500	NR	NR	ug/L	LAB	1998. Lin, H.C., and P.P. Hwang. Acute and Chronic Effects of Antimony Chloride (SbCl3) on Tilapia (Oreochromis mossambicus) Larvae. Bull. Environ. Contam. Toxicol.61(1): 129-134.
Antimony trichloride	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	35500	NR	NR	ug/L	LAB	1998. Lin, H.C., and P.P. Hwang. Acute and Chronic Effects of Antimony Chloride (SbCl3) on Tilapia (Oreochromis mossambicus) Larvae. Bull. Environ. Contam. Toxicol.61(1): 129-134.
Antimony trichloride	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	44937	NR	NR	ug/L	LAB	1998. Lin, H.C., and P.P. Hwang. Acute and Chronic Effects of Antimony Chloride (SbCl3) on Tilapia (Oreochromis mossambicus) Larvae. Bull. Environ. Contam. Toxicol.61(1): 129-134.
Antimony trichloride	Mozambique Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	10036	NR	NR	ug/L	LAB	1998. Lin, H.C., and P.P. Hwang. Acute and Chronic Effects of Antimony Chloride (SbCl3) on Tilapia (Oreochromis mossambicus) Larvae. Bull. Environ. Contam. Toxicol.61(1): 129-134.
Antimony chloride	Northern Squawfish	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Antimony trichloride	Northern Squawfish	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Antimony	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Antimony trichloride	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	580	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Antimony trichloride	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Antimony chloride	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100000	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..

Table C-3. Summary of Results from the EcoTox Database for Fish - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	15100	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	31300	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	51300	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	61700	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	82000	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	8940	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	102000	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	197000	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	30900	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	32500	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	4760	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	47700	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	5020	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	5500	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic oxide	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	16030	NA	NR	ug/L	LAB	1990. Ghosh, A.R., and P. Chakrabarti. Toxicity of Arsenic and Cadmium to a Freshwater Fish Notopterus notopterus. Environ. Ecol.8(2): 576-579.
Arsenic oxide	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	20640	NA	NR	ug/L	LAB	1990. Ghosh, A.R., and P. Chakrabarti. Toxicity of Arsenic and Cadmium to a Freshwater Fish Notopterus notopterus. Environ. Ecol.8(2): 576-579.
Arsenic oxide	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	25830	NA	NR	ug/L	LAB	1990. Ghosh, A.R., and P. Chakrabarti. Toxicity of Arsenic and Cadmium to a Freshwater Fish Notopterus notopterus. Environ. Ecol.8(2): 576-579.
Arsenic oxide	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	30930	NA	NR	ug/L	LAB	1990. Ghosh, A.R., and P. Chakrabarti. Toxicity of Arsenic and Cadmium to a Freshwater Fish Notopterus notopterus. Environ. Ecol.8(2): 576-579.
Arsenic oxide	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	30900	NA	NR	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Arsenic to Freshwater Fishes Mystus vittatus (Bloch) and Puntius javanicus (Blkr.). Environ. Ecol.11(4): 808-811.
Arsenic oxide	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	28500	NA	NR	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Arsenic to Freshwater Fishes Mystus vittatus (Bloch) and Puntius javanicus (Blkr.). Environ. Ecol.11(4): 808-811.
Arsenic oxide	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	26380	NA	NR	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Arsenic to Freshwater Fishes Mystus vittatus (Bloch) and Puntius javanicus (Blkr.). Environ. Ecol.11(4): 808-811.
Arsenic oxide	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	24170	NA	NR	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Arsenic to Freshwater Fishes Mystus vittatus (Bloch) and Puntius javanicus (Blkr.). Environ. Ecol.11(4): 808-811.
Arsenic oxide	Bloater	Fish	Fresh	Mortality	LC50	Not Reported	T	5100*	NA	NR	ug/L	LAB	1980. Passino, D.R.M., and J.M. Kramer. Toxicity of Arsenic and PCBs to Fry of Deepwater Ciscoes (Coregonus). Bull. Environ. Contam. Toxicol.24(4): 527-534.
Arsenic oxide	Bloater	Fish	Fresh	Mortality	LC50	Not Reported	T	13000*	NA	NR	ug/L	LAB	1980. Passino, D.R.M., and J.M. Kramer. Toxicity of Arsenic and PCBs to Fry of Deepwater Ciscoes (Coregonus). Bull. Environ. Contam. Toxicol.24(4): 527-534.
Arsenic oxide	Bloater	Fish	Fresh	Mortality	LC50	Not Reported	T	20000*	NA	NR	ug/L	LAB	1980. Passino, D.R.M., and J.M. Kramer. Toxicity of Arsenic and PCBs to Fry of Deepwater Ciscoes (Coregonus). Bull. Environ. Contam. Toxicol.24(4): 527-534.
Arsenic oxide	Bloater	Fish	Fresh	Mortality	LC50	Not Reported	T	11000*	NA	NR	ug/L	LAB	1980. Passino, D.R.M., and J.M. Kramer. Toxicity of Arsenic and PCBs to Fry of Deepwater Ciscoes (Coregonus). Bull. Environ. Contam. Toxicol.24(4): 527-534.
Arsenic acid (H3AsO4)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	50000	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Arsenic acid (H3AsO4)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	54400	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Arsenic acid (H3AsO4)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	63300	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Arsenic	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1973. Brown, E.R., L. Keith, J.J. Hazdra, and T. Arndt. Tumors in Fish Caught in Polluted Waters: Possible Explanations. In: Y.Ito and R.M.Dutcher (Eds.), Comparative Leukemia Research 1973, Leukemogenesis, Bibl.Haematol.No.40, Univ.of Tokyo Press, Tokyo/Karger, Basel: 47-57.

Table C-3. Summary of Results from the EcoTox Database for Fish - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Trisodium salt	Channel Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NR	NR	ug/L	LAB	1997. Schlenk, D., L. Wolford, M. Chelius, J. Steevens, and K.M. Chan. Effect of Arsenite, Arsenate, and the Herbicide Monosodium Methyl Arsonate (MSMA) on Hepatic Metallothionein Expression and Lipid Peroxidation in Channel Catfish. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.118(2): 177-183.
Arsenic acid (H3AsO4)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	167000	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Arsenic acid (H3AsO4)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	265000	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Arsenic acid (H3AsO4)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	78000	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Arsenic acid (H3AsO4)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	157000	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Arsenic acid (H3AsO4)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	167000	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Arsenic acid (H3AsO4)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	66500	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Arsenic acid (H3AsO4)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	90000	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Arsenic acid (H3AsO4), Disodium salt	Climbing Perch	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1989. Jana, S., and S.S. Sahana. Sensitivity of the Freshwater Fishes Clarias batrachus and Anabas testudineus to Heavy Metals. Environ. Ecol.7(2): 265-270.
Arsenic oxide	Coho Salmon,Silver Salmon	Fish	Fresh	Growth	NR		T	300	NA	NR	ug/L	LAB	1984. Nichols, J.W., G.A. Wedemeyer, F.L. Mayer, W.W. Dickhoff, S.V. Gregory, and W.T. Yasutake. Effects of Freshwater Exposure to Arsenic Trioxide on the Parr-Smolt Transformation of Coho Salmon (Oncorhynchus kisutch). Environ. Toxicol. Chem.3: 143-149.
Arsenic acid (H3AsO4), Disodium salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	698000	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	71000	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	88000	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	306000	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	43600	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	58500	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic oxide	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1984. Nichols, J.W., G.A. Wedemeyer, F.L. Mayer, W.W. Dickhoff, S.V. Gregory, and W.T. Yasutake. Effects of Freshwater Exposure to Arsenic Trioxide on the Parr-Smolt Transformation of Coho Salmon (Oncorhynchus kisutch). Environ. Toxicol. Chem.3: 143-149.
Arsenic acid (H3AsO4), Disodium salt	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	133000	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Arsenic acid (H3AsO4), Disodium salt	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	125000	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Arsenic acid (H3AsO4), Disodium salt	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	110000	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Arsenic acid (H3AsO4), Disodium salt	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	105000	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Arsenic acid (H3AsO4)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1963. Loeb, H.A., and W.H. Kelly. Acute Oral Toxicity of 1,496 Chemicals Force-Fed to Carp. U.S.Fish.Wildl.Serv., Sp.Sci.Rep.-Fish.No.471, Washington, D.C.: 124 p..
Arsenic oxide	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1963. Loeb, H.A., and W.H. Kelly. Acute Oral Toxicity of 1,496 Chemicals Force-Fed to Carp. U.S.Fish.Wildl.Serv., Sp.Sci.Rep.-Fish.No.471, Washington, D.C.: 124 p..
Arsenic acid, Calcium salt (2:3)	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	NR	NA	NR	ug/L	LAB	1963. Loeb, H.A., and W.H. Kelly. Acute Oral Toxicity of 1,496 Chemicals Force-Fed to Carp. U.S.Fish.Wildl.Serv., Sp.Sci.Rep.-Fish.No.471, Washington, D.C.: 124 p..
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	1500	NA	NR	ug/L	LAB	1982. De Foe, D.L.. Arsenic (V) Test Results. U.S.EPA, Duluth, MN (Memo to R.L.Spehar, U.S.EPA, Duluth, MN): 9 p..

Table C-3. Summary of Results from the EcoTox Database for Fish - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	1500	NA	NR	ug/L	LAB	1982. De Foe, D.L.. Arsenic (V) Test Results. U.S.EPA, Duluth, MN (Memo to R.L.Spehar, U.S.EPA, Duluth, MN): 9 p..
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	530	NA	NR	ug/L	LAB	1982. De Foe, D.L.. Arsenic (V) Test Results. U.S.EPA, Duluth, MN (Memo to R.L.Spehar, U.S.EPA, Duluth, MN): 9 p..
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	530	NA	NR	ug/L	LAB	1982. De Foe, D.L.. Arsenic (V) Test Results. U.S.EPA, Duluth, MN (Memo to R.L.Spehar, U.S.EPA, Duluth, MN): 9 p..
Arsenic	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9900	NA	NR	ug/L	LAB	1993. Dyer, S.D., G.L. Brooks, K.L. Dickson, B.M. Sanders, and E.G. Zimmerman. Synthesis and Accumulation of Stress Proteins in Tissues of Arsenite-Exposed Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.12: 913-924.
Arsenic acid (H3AsO4), Disodium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Arsenic acid (H3AsO4), Disodium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19100	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Arsenic acid (H3AsO4), Disodium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19100	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Arsenic acid (H3AsO4), Disodium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	17900	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	25600	NA	NR	ug/L	LAB	1982. De Foe, D.L.. Arsenic (V) Test Results. U.S.EPA, Duluth, MN (Memo to R.L.Spehar, U.S.EPA, Duluth, MN): 9 p..
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	26300	NA	NR	ug/L	LAB	1982. De Foe, D.L.. Arsenic (V) Test Results. U.S.EPA, Duluth, MN (Memo to R.L.Spehar, U.S.EPA, Duluth, MN): 9 p..
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	42000	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. De Foe, D.L.. Arsenic (V) Test Results. U.S.EPA, Duluth, MN (Memo to R.L.Spehar, U.S.EPA, Duluth, MN): 9 p..
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	73500	NA	NR	ug/L	LAB	1982. De Foe, D.L.. Arsenic (V) Test Results. U.S.EPA, Duluth, MN (Memo to R.L.Spehar, U.S.EPA, Duluth, MN): 9 p..
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	73500	NA	NR	ug/L	LAB	1982. De Foe, D.L.. Arsenic (V) Test Results. U.S.EPA, Duluth, MN (Memo to R.L.Spehar, U.S.EPA, Duluth, MN): 9 p..
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3600	NA	NR	ug/L	LAB	1982. De Foe, D.L.. Arsenic (V) Test Results. U.S.EPA, Duluth, MN (Memo to R.L.Spehar, U.S.EPA, Duluth, MN): 9 p..
Arsenic pentoxide	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	7900	NA	NR	ug/L	LAB	1982. De Foe, D.L.. Arsenic (V) Test Results. U.S.EPA, Duluth, MN (Memo to R.L.Spehar, U.S.EPA, Duluth, MN): 9 p..
Arsenic acid (H3AsO4), Sodium salt	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	33100	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Arsenic acid (H3AsO4), Sodium salt	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	33100	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Arsenic acid (H3AsO4), Sodium salt	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	33100	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Arsenic acid (H3AsO4), Sodium salt	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	33100	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Arsenic oxide	Giant Gourami	Fish	Fresh	Growth	NR		T	4000*	NA	NR	ug/L	LAB	1982. Pandey, K., and J.P. Shukla. Deleterious Effects of Arsenic on the Growth of Fingerlings of a Freshwater Fish, Colisa fasciatus (Bl. & Sch.). Acta Pharm. Toxicol.50(5): 398-400.
Arsenic oxide	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	12160*	NA	NR	ug/L	LAB	1982. Pandey, K., and J.P. Shukla. Deleterious Effects of Arsenic on the Growth of Fingerlings of a Freshwater Fish, Colisa fasciatus (Bl. & Sch.). Acta Pharm. Toxicol.50(5): 398-400.
Arsenic oxide	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	27000*	NA	NR	ug/L	LAB	1985. Shukla, J.P., and K. Pandey. Toxicity and Long-Term Effect of Arsenic on the Gonadal Protein Metabolism in a Tropical Freshwater Fish, Colisa fasciatus (Bl. & Sch.). Acta Hydrochim. Hydrobiol.13(1): 127-131.

Table C-3. Summary of Results from the EcoTox Database for Fish - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic oxide	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	10610*	NA	NR	ug/L	LAB	1982. Pandey, K., and J.P. Shukla. Deleterious Effects of Arsenic on the Growth of Fingerlings of a Freshwater Fish, Colisa fasciatus (Bl. & Sch.). Acta Pharm. Toxicol.50(5): 398-400.
Arsenic oxide	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	24000*	NA	NR	ug/L	LAB	1985. Shukla, J.P., and K. Pandey. Toxicity and Long-Term Effect of Arsenic on the Gonadal Protein Metabolism in a Tropical Freshwater Fish, Colisa fasciatus (Bl. & Sch.). Acta Hydrochim. Hydrobiol.13(1): 127-131.
Arsenic oxide	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	23000*	NA	NR	ug/L	LAB	1985. Shukla, J.P., and K. Pandey. Toxicity and Long-Term Effect of Arsenic on the Gonadal Protein Metabolism in a Tropical Freshwater Fish, Colisa fasciatus (Bl. & Sch.). Acta Hydrochim. Hydrobiol.13(1): 127-131.
Arsenic oxide	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	7631*	NA	NR	ug/L	LAB	1982. Pandey, K., and J.P. Shukla. Deleterious Effects of Arsenic on the Growth of Fingerlings of a Freshwater Fish, Colisa fasciatus (Bl. & Sch.). Acta Pharm. Toxicol.50(5): 398-400.
Arsenic oxide	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	20000*	NA	NR	ug/L	LAB	1985. Shukla, J.P., and K. Pandey. Toxicity and Long-Term Effect of Arsenic on the Gonadal Protein Metabolism in a Tropical Freshwater Fish, Colisa fasciatus (Bl. & Sch.). Acta Hydrochim. Hydrobiol.13(1): 127-131.
Arsenic oxide	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	6090*	NA	NR	ug/L	LAB	1982. Pandey, K., and J.P. Shukla. Deleterious Effects of Arsenic on the Growth of Fingerlings of a Freshwater Fish, Colisa fasciatus (Bl. & Sch.). Acta Pharm. Toxicol.50(5): 398-400.
Arsenic	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	490	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Arsenic acid (H3AsO4), Sodium salt	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1970. Weir, P.A., and C.H. Hine. Effects of Various Metals on Behavior of Conditioned Goldfish. Arch. Environ. Health20(1): 45-51.
Arsenic acid (H3AsO4), Disodium salt	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Maeda, S., R. Inoue, T. Kozono, T. Tokuda, A. Ohki, and T. Takeshita. Arsenic Metabolism in a Freshwater Food Chain. Chemosphere20(1-2): 101-108.
Arsenic acid (H3AsO4), Disodium salt	Green Sunfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	1000	NA	NR	ug/L	LAB	1976. Sorensen, E.M.B.. Toxicity and Accumulation of Arsenic in Green Sunfish, Lepomis cyanellus, Exposed to Arsenate in Water. Bull. Environ. Contam. Toxicol.15(6): 756-761.
Arsenic acid (H3AsO4), Disodium salt	Green Sunfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	350	NA	NR	ug/L	LAB	1976. Sorensen, E.M.B.. Toxicity and Accumulation of Arsenic in Green Sunfish, Lepomis cyanellus, Exposed to Arsenate in Water. Bull. Environ. Contam. Toxicol.15(6): 756-761.
Arsenic acid (H3AsO4), Disodium salt	Green Sunfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	175	NA	NR	ug/L	LAB	1976. Sorensen, E.M.B.. Toxicity and Accumulation of Arsenic in Green Sunfish, Lepomis cyanellus, Exposed to Arsenate in Water. Bull. Environ. Contam. Toxicol.15(6): 756-761.
Arsenic acid (H3AsO4), Disodium salt	Green Sunfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	150	NA	NR	ug/L	LAB	1976. Sorensen, E.M.B.. Toxicity and Accumulation of Arsenic in Green Sunfish, Lepomis cyanellus, Exposed to Arsenate in Water. Bull. Environ. Contam. Toxicol.15(6): 756-761.
Arsenic oxide	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	F	26500	NA	NR	ug/L	LAB	1993. Hwang, P.P., and Y.N. Tsai. Effects of Arsenic on Osmoregulation in the Tilapia Oreochromis mossambicus Reared in Seawater. Mar. Biol.117(4): 551-558.
Arsenic oxide	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	F	71700	NA	NR	ug/L	LAB	1993. Hwang, P.P., and Y.N. Tsai. Effects of Arsenic on Osmoregulation in the Tilapia Oreochromis mossambicus Reared in Seawater. Mar. Biol.117(4): 551-558.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Cockell, K.A., J.W. Hilton, and W.J. Bettger. Chronic Toxicity of Dietary Disodium Arsenate Heptahydrate to Juvenile Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.21: 518-527.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Growth	NR	Gall Bladder	T	55000	NA	NR	ug/L	LAB	1992. Cockell, K.A., J.W. Hilton, and W.J. Bettger. Hepatobiliary and Hematological Effects of Dietary Disodium Arsenate Heptahydrate in Juvenile Rainbow Trout (Oncorhynchus mykiss). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.103(3): 453-458.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Growth	NR	Gall Bladder	T	NR	NA	NR	ug/L	LAB	1992. Cockell, K.A., J.W. Hilton, and W.J. Bettger. Hepatobiliary and Hematological Effects of Dietary Disodium Arsenate Heptahydrate in Juvenile Rainbow Trout (Oncorhynchus mykiss). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.103(3): 453-458.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	120000	NA	NR	ug/L	LAB	1988. Cockell, K.A., and J.W. Hilton. Preliminary Investigations on the Comparative Chronic Toxicity of Four Dietary Arsenicals to Juvenile Rainbow Trout (Salmo gairdneri R.). Aquat. Toxicol.12(1): 73-82.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	58000	NA	NR	ug/L	LAB	1993. Cockell, K.A., and W.J. Bettger. Investigations of the Gallbladder Pathology Associated with Dietary Exposure to Disodium Arsenate Heptahydrate in Juvenile Rainbow Trout (Oncorhynchus mykiss). Toxicology77(3): 233-248.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	55000	NA	NR	ug/L	LAB	1992. Cockell, K.A., J.W. Hilton, and W.J. Bettger. Hepatobiliary and Hematological Effects of Dietary Disodium Arsenate Heptahydrate in Juvenile Rainbow Trout (Oncorhynchus mykiss). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.103(3): 453-458.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NA	NR	ug/L	LAB	1992. Cockell, K.A., J.W. Hilton, and W.J. Bettger. Hepatobiliary and Hematological Effects of Dietary Disodium Arsenate Heptahydrate in Juvenile Rainbow Trout (Oncorhynchus mykiss). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.103(3): 453-458.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1990. McGeachy, S.M., and D.G. Dixon. Effect of Temperature on the Chronic Toxicity of Arsenate to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.47(11): 2228-2234.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1990. McGeachy, S.M., and D.G. Dixon. Effect of Temperature on the Chronic Toxicity of Arsenate to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.47(11): 2228-2234.
Arsenic acid (H3AsO4), Sodium salt	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. McGeachy, S.M., M.G. Rankin, and D.G. Dixon. The Effects of Water Temperature on Chronic Toxicity of Sodium Arsenate to Rainbow Trout (Salmo gairdneri). Can. Tech. Rep. Fish. Aquat. Sci.1607: 46-49.

Table C-3. Summary of Results from the EcoTox Database for Fish - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Sodium salt	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	36000	NA	NR	ug/L	LAB	1988. McGeachy, S.M., M.G. Rankin, and D.G. Dixon. The Effects of Water Temperature on Chronic Toxicity of Sodium Arsenate to Rainbow Trout (Salmo gairdneri). Can. Tech. Rep. Fish. Aquat. Sci.1607: 46-49.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	2480	NA	NR	ug/L	LAB	1994. Rankin, M.G., and D.G. Dixon. Acute and Chronic Toxicity of Waterborne Arsenite to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.51(2): 372-380.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	9640	NA	NR	ug/L	LAB	1994. Rankin, M.G., and D.G. Dixon. Acute and Chronic Toxicity of Waterborne Arsenite to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.51(2): 372-380.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1987. Rankin, M.G., and D.G. Dixon. Acute and Chronic Toxicity of Waterborne Inorganic Trivalent Arsenic to Rainbow Trout (Salmo gairdneri). In: J.S.S.Lakshminarayana (Ed.), Proc.13th Annual Aquatic Toxicity Workshop, Nov.12-14, 1986, Moncton, New Brunswick, Can.Tech.Rep.Fish.Aquat.Sci.No.1575: 30-33.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1975. Speyer, M.R., and G. Leduc. Effects of Arsenic Trioxide on Growth of Rainbow Trout. In: Abstr., Int.Conf.on Heavy Metals in the Environment, Oct.27-31, 1975, Toronto, Ontario: C17 - C19.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Speyer, M.R.. Some Effects of Chronic Combined Arsenic and Cyanide Poisoning on the Physiology of Rainbow Trout. M.S.Thesis, Concordia Univ., Montreal, Can.:76 p.; In: Int.Conf.on Heavy Metals in the Environment, Abstracts, Institute for Environmental Studies, University of Toronto, Ontario, Canada:C17-C19.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Growth	NR		T	200000	NA	NR	ug/L	LAB	1988. Cockell, K.A., and J.W. Hilton. Preliminary Investigations on the Comparative Chronic Toxicity of Four Dietary Arsenicals to Juvenile Rainbow Trout (Salmo gairdneri R.). Aquat. Toxicol.12(1): 73-82.
Arsenic	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Arsenic acid (H3AsO4)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	53050	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Arsenic acid (H3AsO4)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	72000	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	141000	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	43000	NA	NR	ug/L	LAB	1982. Qureshi, A.A., K.W. Flood, S.R. Thompson, S.M. Janhurst, C.S. Inniss, and D.A. Rokosh. Comparison of a Luminescent Bacterial Test with Other Bioassays for Determining Toxicity of Pure Compounds and Complex Effluents. In: J.G.Pearson, R.B.Foster and W.E.Bishop (Eds.), Aquatic Toxicology and Hazard Assessment, 5th Confrence, ASTM STP 766, Philadelphia, PA: 179-195.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	67500	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	142300	NA	NR	ug/L	LAB	1987. McGeachy, S.M., and D.G. Dixon. The Effects of Temperature on Waterborne Arsenic Toxicity to Rainbow Trout (Salmo gairdneri). In: J.S.S.Lakshminarayana (Ed.), Proc.13th Annual Aquatic Toxicity Workshop, Nov.12-14, 1986, Moncton, New Brunswick, Can.Tech.Rep.Fish.Aquat.Sci.No.1575: 27-29.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	64500	NA	NR	ug/L	LAB	1987. McGeachy, S.M., and D.G. Dixon. The Effects of Temperature on Waterborne Arsenic Toxicity to Rainbow Trout (Salmo gairdneri). In: J.S.S.Lakshminarayana (Ed.), Proc.13th Annual Aquatic Toxicity Workshop, Nov.12-14, 1986, Moncton, New Brunswick, Can.Tech.Rep.Fish.Aquat.Sci.No.1575: 27-29.
Arsenic acid (H3AsO4), Sodium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10800	NR	NR	ug/L	LAB	1977. Hale, J.G.. Toxicity of Metal Mining Wastes. Bull. Environ. Contam. Toxicol.17(1): 66-73.
Arsenic acid (H3AsO4), Sodium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	115000	NA	NR	ug/L	LAB	1988. McGeachy, S.M., M.G. Rankin, and D.G. Dixon. The Effects of Water Temperature on Chronic Toxicity of Sodium Arsenate to Rainbow Trout (Salmo gairdneri). Can. Tech. Rep. Fish. Aquat. Sci.1607: 46-49.
Arsenic acid (H3AsO4), Sodium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	58000	NA	NR	ug/L	LAB	1988. McGeachy, S.M., M.G. Rankin, and D.G. Dixon. The Effects of Water Temperature on Chronic Toxicity of Sodium Arsenate to Rainbow Trout (Salmo gairdneri). Can. Tech. Rep. Fish. Aquat. Sci.1607: 46-49.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20200	NA	NR	ug/L	LAB	1994. Rankin, M.G., and D.G. Dixon. Acute and Chronic Toxicity of Waterborne Arsenite to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.51(2): 372-380.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1994. Rankin, M.G., and D.G. Dixon. Acute and Chronic Toxicity of Waterborne Arsenite to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.51(2): 372-380.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1987. McGeachy, S.M., and D.G. Dixon. The Effects of Temperature on Waterborne Arsenic Toxicity to Rainbow Trout (Salmo gairdneri). In: J.S.S.Lakshminarayana (Ed.), Proc.13th Annual Aquatic Toxicity Workshop, Nov.12-14, 1986, Moncton, New Brunswick, Can.Tech.Rep.Fish.Aquat.Sci.No.1575: 27-29.

Table C-3. Summary of Results from the EcoTox Database for Fish - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	19600	NA	NR	ug/L	LAB	1987. McGeachy, S.M., and D.G. Dixon. The Effects of Temperature on Waterborne Arsenic Toxicity to Rainbow Trout (Salmo gairdneri). In: J.S.S.Lakshminarayana (Ed.), Proc.13th Annual Aquatic Toxicity Workshop, Nov.12-14, 1986, Moncton, New Brunswick, Can.Tech.Rep.Fish.Aquat.Sci.No.1575: 27-29.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10800*	NA	NR	ug/L	LAB	1989. McGeachy, S.M., and D.G. Dixon. The Impact of Temperature on the Acute Toxicity of Arsenate and Arsenite to Rainbow Trout (Salmo gairdneri). Ecotoxicol. Environ. Saf.17(1): 86-93.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	12600*	NA	NR	ug/L	LAB	1989. McGeachy, S.M., and D.G. Dixon. The Impact of Temperature on the Acute Toxicity of Arsenate and Arsenite to Rainbow Trout (Salmo gairdneri). Ecotoxicol. Environ. Saf.17(1): 86-93.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13300	NA	NR	ug/L	LAB	1981. Dixon, D.G., and J.B. Sprague. Acclimation-Induced Changes in Toxicity of Arsenic and Cyanide to Rainbow Trout, Salmo gairdneri Richardson. J. Fish Biol.18(5): 579-589.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18100	NA	NR	ug/L	LAB	1994. Rankin, M.G., and D.G. Dixon. Acute and Chronic Toxicity of Waterborne Arsenite to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.51(2): 372-380.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18900	NA	NR	ug/L	LAB	1994. Rankin, M.G., and D.G. Dixon. Acute and Chronic Toxicity of Waterborne Arsenite to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.51(2): 372-380.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18475	NA	NR	ug/L	LAB	1987. Rankin, M.G., and D.G. Dixon. Acute and Chronic Toxicity of Waterborne Inorganic Trivalent Arsenic to Rainbow Trout (Salmo gairdneri). In: J.S.S.Lakshminarayana (Ed.), Proc.13th Annual Aquatic Toxicity Workshop, Nov.12-14, 1986, Moncton, New Brunswick, Can.Tech.Rep.Fish.Aquat.Sci.No.1575: 30-33.
Arsenic pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	28000	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Cockell, K.A.. Chronic Toxicity of Dietary Arsenic to Rainbow Trout, Oncorhynchus mykiss. Ph.D Thesis, Univ.of Guelph, Ontario, Canada: 187 p..
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1976. Dabrowski, K.R.. The Effect of Arsenic on Embrional Development of Rainbow Trout (Salmo gairdneri, Rich.). Water Res.10(8): 793-796.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1400	NA	NR	ug/L	LAB	1990. McGeachy, S.M., and D.G. Dixon. Effect of Temperature on the Chronic Toxicity of Arsenate to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.47(11): 2228-2234.
Arsenic acid (H3AsO4), Disodium salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	8200	NA	NR	ug/L	LAB	1990. McGeachy, S.M., and D.G. Dixon. Effect of Temperature on the Chronic Toxicity of Arsenate to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.47(11): 2228-2234.
Arsenic acid (H3AsO4), Sodium salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	36000	NA	NR	ug/L	LAB	1988. McGeachy, S.M., M.G. Rankin, and D.G. Dixon. The Effects of Water Temperature on Chronic Toxicity of Sodium Arsenate to Rainbow Trout (Salmo gairdneri). Can. Tech. Rep. Fish. Aquat. Sci.1607: 46-49.
Arsenic acid (H3AsO4), Sodium salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	18000	NA	NR	ug/L	LAB	1988. McGeachy, S.M., M.G. Rankin, and D.G. Dixon. The Effects of Water Temperature on Chronic Toxicity of Sodium Arsenate to Rainbow Trout (Salmo gairdneri). Can. Tech. Rep. Fish. Aquat. Sci.1607: 46-49.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Speyer, M.R.. Some Effects of Chronic Combined Arsenic and Cyanide Poisoning on the Physiology of Rainbow Trout. M.S.Thesis, Concordia Univ., Montreal, Can.:76 p.; In: Int.Conf.on Heavy Metals in the Environment, Abstracts, Institute for Environmental Studies, University of Toronto, Ontario, Canada:C17-C19.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	961	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic oxide	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1976. Dabrowski, K.R.. The Effect of Arsenic on Embrional Development of Rainbow Trout (Salmo gairdneri, Rich.). Water Res.10(8): 793-796.
Arsenic pentoxide	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	973	NA	NR	ug/L	LAB	1980. Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Arch. Environ. Contam. Toxicol.9(1): 53-63.
Arsenic acid (H3AsO4), Disodium salt	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	19200	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Arsenic acid (H3AsO4), Disodium salt	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	17800	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Arsenic acid (H3AsO4), Disodium salt	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	17800	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Arsenic acid (H3AsO4), Disodium salt	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	17800	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.

Table C-3. Summary of Results from the EcoTox Database for Fish - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic acid (H3AsO4), Disodium salt	Rio Grande Silvery Minnow	Fish	Fresh	Mortality	EC50	Not Reported	T	41500	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Arsenic acid (H3AsO4), Disodium salt	Rio Grande Silvery Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	41500	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Arsenic acid (H3AsO4), Disodium salt	Rio Grande Silvery Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	39500	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Arsenic acid (H3AsO4), Disodium salt	Rio Grande Silvery Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	38300	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Arsenic acid (H3AsO4), Disodium salt	Rio Grande Silvery Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	34300	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Arsenic acid (H3AsO4), Sodium salt	Sailfin Molly	Fish	Fresh	Mortality	LC50	Not Reported	T	70000	NA	NR	ug/L	LAB	1980. Abdelghani, A.A., A.C. Anderson, and D.B. McDonell. Toxicity of Three Arsenical Compounds. Cancer Res.13(7): 31-32.
Arsenic acid (H3AsO4), Sodium salt	Sailfin Molly	Fish	Fresh	Mortality	LC50	Not Reported	T	64000	NA	NR	ug/L	LAB	1980. Abdelghani, A.A., A.C. Anderson, and D.B. McDonell. Toxicity of Three Arsenical Compounds. Cancer Res.13(7): 31-32.
Arsenic	nake-Head Catfi	Fish	Fresh	Growth	NR		T	5000	NA	NR	ug/L	NR	1987. Jana, S.R., and N. Bandyopadhyaya. Effect of Heavy Metals on Some Biochemical Parameters in the Freshwater Fish Channa punctatus. Aquat. Sci. Fish. Abstr.18(4): 5486-1Q18.
Arsenic oxide	nake-Head Catfi	Fish	Fresh	Growth	NR		T	5000*	NA	NR	ug/L	LAB	1987. Shukla, J.P., K.N. Shukla, and U.N. Dwivedi. Survivality and Impaired Growth in Arsenic Treated Fingerlings of Channa punctatus, a Fresh Water Murrel. Acta Hydrochim. Hydrobiol.15(3): 307-311.
Arsenic oxide	nake-Head Catfi	Fish	Fresh	Mortality	LC50	Not Reported	T	14700*	NA	NR	ug/L	LAB	1987. Shukla, J.P., K.N. Shukla, and U.N. Dwivedi. Survivality and Impaired Growth in Arsenic Treated Fingerlings of Channa punctatus, a Fresh Water Murrel. Acta Hydrochim. Hydrobiol.15(3): 307-311.
Arsenic oxide	nake-Head Catfi	Fish	Fresh	Mortality	LC50	Not Reported	T	10900*	NA	NR	ug/L	LAB	1987. Shukla, J.P., K.N. Shukla, and U.N. Dwivedi. Survivality and Impaired Growth in Arsenic Treated Fingerlings of Channa punctatus, a Fresh Water Murrel. Acta Hydrochim. Hydrobiol.15(3): 307-311.
Arsenic acid (H3AsO4), Disodium salt	Striped Bass	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1997. Blazer, V.S., J.W. Fournie, and B.A. Weeks-Perkins. Macrophage Aggregates: Biomarker for Immune Function in Fishes?. In: F.J.Dwyer, T.R.Doane, and M.L.Hinman (Eds.), Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment, 6th Volume, ASTM STP 1317, Philadelphia, PA: 360-375.
Arsenic acid (H3AsO4), Sodium salt	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	18690	NR	NR	ug/L	LAB	1986. Klauda, R.J.. Acute and Chronic Effects of Waterborne Arsenic and Selenium on the Early Life Stages of Striped Bass (Morone saxatilis). Rep.No.JHU/APL PPRP-98, Rep.to Maryland Power Plant Siting Program, John Hopkins University, Laurel, MD: 209 p..
Arsenic acid (H3AsO4), Sodium salt	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	7280	NR	NR	ug/L	LAB	1986. Klauda, R.J.. Acute and Chronic Effects of Waterborne Arsenic and Selenium on the Early Life Stages of Striped Bass (Morone saxatilis). Rep.No.JHU/APL PPRP-98, Rep.to Maryland Power Plant Siting Program, John Hopkins University, Laurel, MD: 209 p..
Arsenic pentoxide	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	30500	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Arsenic pentoxide	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	40500	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Arsenic acid (H3AsO4), Sodium salt	Striped Bass	Fish	NR	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Klauda, R.J.. Influence of Delayed Initial Feeding on Mortality of Striped Bass Larvae Exposed to Arsenic and Selenium. Am. Fish. Soc. Annu. Meet.115: 92-93.
Arsenic oxide	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	29620	NA	NR	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Arsenic to Freshwater Fishes Mystus vittatus (Bloch) and Puntius javanicus (Blkr.). Environ. Ecol.11(4): 808-811.
Arsenic oxide	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	25820	NA	NR	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Arsenic to Freshwater Fishes Mystus vittatus (Bloch) and Puntius javanicus (Blkr.). Environ. Ecol.11(4): 808-811.
Arsenic oxide	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	22130	NA	NR	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Arsenic to Freshwater Fishes Mystus vittatus (Bloch) and Puntius javanicus (Blkr.). Environ. Ecol.11(4): 808-811.

Table C-3. Summary of Results from the EcoTox Database for Fish - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic oxide	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Arsenic to Freshwater Fishes Mystus vittatus (Bloch) and Puntius javanicus (Blkr.). Environ. Ecol.11(4): 808-811.
Arsenic oxide	Spot Barb, Dotted	Fish	Fresh	Mortality	LC50	Not Reported	T	18000*	NA	NR	ug/L	LAB	1979. Pandey, K., and J.P. Shukla. Arsenic Toxicity in a Tropical Fresh Water Fish, Puntius sophore. Natl. Acad. Sci. Lett. (India)2(11): 425-426.
Arsenic oxide	Spot Barb, Dotted	Fish	Fresh	Mortality	LC50	Not Reported	T	14000*	NA	NR	ug/L	LAB	1979. Pandey, K., and J.P. Shukla. Arsenic Toxicity in a Tropical Fresh Water Fish, Puntius sophore. Natl. Acad. Sci. Lett. (India)2(11): 425-426.
Arsenic acid (H3AsO4), Disodium salt	Walking Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1989. Jana, S., and S.S. Sahana. Sensitivity of the Freshwater Fishes Clarias batrachus and Anabas testudineus to Heavy Metals. Environ. Ecol.7(2): 265-270.
Arsenic acid (H3AsO4), Disodium salt	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Newman, M.C., S.A. Diamond, M. Mulvey, and P. Dixon. Allozyme Genotype and Time to Death of Mosquitofish, Gambusia affinis (Baird and Girard) During Acute Toxicant Exposure: A Comparison of Arsenate and Inorganic Mercury. Aquat. Toxicol.15(2): 141-156.
Arsenic oxide	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Arsenic oxide	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	23000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Arsenic oxide	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	23000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Arsenic oxide	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Arsenic oxide	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	29000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.

ARCADIS

Table C-4. Summary of Results from the EcoTox Database for Fish - Barium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Barium	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	198000	NR	NR	ug/L	LAB	1978. U.S.Environmental Protection Agency. In-Depth Studies on Health and Environmental Impacts of Selected Water Pollutants. U.S.EPA Contract No.68-01-4646, Duluth, MN: 9 p..
Barium chloride	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	150000	NA	NR	ug/L	LAB	1974. Woodiwiss, F.S., and G. Fretwell. The Toxicities of Sewage Effluents, Industrial Discharges and Some Chemical Substances to Brown Trout (Salmo trutta) in the Trent River Authority Area. Water Pollut. Control73: 396-405.
Barium chloride	Salmon,Silver S	Fish	Fresh	Mortality	LOEC	Not Reported	T	158000	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Barium chloride	Salmon,Silver S	Fish	Fresh	Mortality	LOEC	Not Reported	T	282000	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Barium chloride	Salmon,Silver S	Fish	Fresh	Mortality	LOEC	Not Reported	T	500000	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Barium chloride	Salmon,Silver S	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Barium chloride	Salmon,Silver S	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Barium chloride	Salmon,Silver S	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Barium chloride	Salmon,Silver S	Fish	Fresh	Mortality	NOEC	Not Reported	T	88800	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Barium chloride	Salmon,Silver S	Fish	Fresh	Mortality	NOEC	Not Reported	T	158000	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Barium chloride	Salmon,Silver S	Fish	Fresh	Mortality	NOEC	Not Reported	T	282000	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Barium chloride	Salmon,Silver S	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	282000	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Barium sulfate	Mollies	Fish	NR	Mortality	LC0	Not Reported	F	59000000*	NA	NR	ug/L	LAB	1975. Grantham, C.K., and J.P. Sloan. Toxicity Study Drilling Fluid Chemicals on Aquatic Life. EPA 560/1-75-004, Conf.Proc.on Environ.Aspects of Chemical Use in Well-Drilling Operations, Research Triangle Inst., NC.
Barium chloride	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	42700	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Barium nitrate	Threespine Stickleback	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	400000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Barium carbonate	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	F	6950000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Barium carbonate	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	F	6950000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Barium carbonate	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	F	6950000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Barium chloride	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	2910000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Barium chloride	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	2120000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Barium chloride	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	1080000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Barium chloride	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	66200*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.

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Table C-5. Summary of Results from the EcoTox Database for Fish - Beryllium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Beryllium sulfate	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	12000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Beryllium sulfate	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	1300	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Beryllium sulfate	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	59300	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	59300	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium nitrate	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1978. Hildebrand, S.G., and R.M. Cushman. Toxicity of Gallium and Beryllium to Developing Carp Eggs (Cyprinus carpio) Utilizing Copper as a Reference. Toxicol. Lett.2(2): 91-95.
Beryllium nitrate	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	80	NA	NR	ug/L	LAB	1978. Hildebrand, S.G., and R.M. Cushman. Toxicity of Gallium and Beryllium to Developing Carp Eggs (Cyprinus carpio) Utilizing Copper as a Reference. Toxicol. Lett.2(2): 91-95.
Beryllium chloride	Cyprinid	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Lebedeva, G.D.. The Effect of Beryllium on Aquatic Organisms. Zool. Zh.39: 1779-1782.
Beryllium chloride	Cyprinid	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1600	NR	NR	ug/L	LAB	1960. Lebedeva, G.D.. The Effect of Beryllium on Aquatic Organisms. Zool. Zh.39: 1779-1782.
Beryllium chloride	Cyprinid	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	800	NR	NR	ug/L	LAB	1960. Lebedeva, G.D.. The Effect of Beryllium on Aquatic Organisms. Zool. Zh.39: 1779-1782.
Beryllium sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	26100	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	25400	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	40200	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	37900	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	17500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	17900	NA	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Beryllium sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	30800	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	27700	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	27400	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	150	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Beryllium chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	15000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Beryllium sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	11000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Beryllium sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	200	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Nitric acid, Beryllium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	150	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Nitric acid, Beryllium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	20000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Beryllium sulfate	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	41100	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	41100	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	46300	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	38400	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	55900	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	49300	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	48300	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	46500	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Beryllium sulfate	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	41600	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..

Table C-5. Summary of Results from the EcoTox Database for Fish - Beryllium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	14000	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	6800	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	25000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	44000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	920	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	13700	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	6800	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	28000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	370	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	13700	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	19000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.

Table C-5. Summary of Results from the EcoTox Database for Fish - Beryllium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	28000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	450	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	6100	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	NA	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Slonim, A.R.. Acute Toxicity of Beryllium Sulfate to the Common Guppy. J. Water Pollut. Control Fed.45(10): 2110-2122.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	20000	NR	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NR	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000	NR	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2500	NR	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium sulfate	Guppy	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5000	NR	NR	ug/L	LAB	1973. Slonim, C.B., and A.R. Slonim. Effect of Water Hardness on the Tolerance of the Guppy to Beryllium Sulfate. Bull. Environ. Contam. Toxicol.10(5): 295-301.
Beryllium chloride	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.

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Table C-6. Summary of Results from the EcoTox Database for Fish - Boron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Boron sodium oxide (B4Na2O7)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	F	15000	NA	NR	ug/L	LAB	1954. Turnbull, H., J.G. Demann, and R.F. Weston. Toxicity of Various Refinery Materials to Fresh Water Fish. J. Ind. Eng. Chem.46(2): 324-333.
Boric acid (H3BO3)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	280000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Boric acid (H3BO3)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	552000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Boric acid (H3BO3)	Channel Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	102000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Channel Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	220000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Channel Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	155000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Channel Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	22000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	566000	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Boric acid (H3BO3)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	600000	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Boric acid (H3BO3)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	600000	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Boric acid (H3BO3)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	725000	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Boric acid (H3BO3)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	447000	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Boric acid (H3BO3)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	279000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Boric acid (H3BO3)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	527000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Boric acid (H3BO3)	Colorado Squawfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	360000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Boric acid (H3BO3)	Colorado Squawfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	216000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Boric acid (H3BO3)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	1E+07	NR	NR	ug/L	LAB	1972. Terhaar, C.J., W.S. Ewell, S.P. Dziuba, and D.W. Fassett. Toxicity of Photographic Processing Chemicals to Fish. Photogr. Sci. Eng.16(5): 370-377.
Boric acid (H3BO3)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1000000	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Boric acid (H3BO3)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	337000	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Boric acid (H3BO3)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	225000	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Boric acid (H3BO3)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	125000	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Boric acid (H3BO3)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	170000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	178000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	46000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	75000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	92000	NA	NR	ug/L	LAB	1993. Black, J.A., J.B. Barnum, and W.J. Birge. An Integrated Assessment of the Biological Effects of Boron to the Rainbow Trout. Chemosphere26(7): 1383-1413.
Boric acid (H3BO3)	Largemouth Bass	Fish	Fresh	Mortality	LOEC	Not Reported	T	12170	NA	NR	ug/L	LAB	1993. Black, J.A., J.B. Barnum, and W.J. Birge. An Integrated Assessment of the Biological Effects of Boron to the Rainbow Trout. Chemosphere26(7): 1383-1413.
Boric acid (H3BO3)	Largemouth Bass	Fish	Fresh	Mortality	NOEC	Not Reported	T	1390	NA	NR	ug/L	LAB	1993. Black, J.A., J.B. Barnum, and W.J. Birge. An Integrated Assessment of the Biological Effects of Boron to the Rainbow Trout. Chemosphere26(7): 1383-1413.
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	138000	NA	NR	ug/L	LAB	1993. Black, J.A., J.B. Barnum, and W.J. Birge. An Integrated Assessment of the Biological Effects of Boron to the Rainbow Trout. Chemosphere26(7): 1383-1413.

Table C-6. Summary of Results from the EcoTox Database for Fish - Boron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	NR	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	79000	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70100	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	150000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	100000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	100000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	79000	NA	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. Sensitivity of Vertebrate Embryos to Boron Compounds. EPA 560/1-76-008, U.S.EPA, Washington DC: 66 p..
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Black, J.A., J.B. Barnum, and W.J. Birge. An Integrated Assessment of the Biological Effects of Boron to the Rainbow Trout. Chemosphere26(7): 1383-1413.
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	100	NA	NR	ug/L	LAB	1993. Black, J.A., J.B. Barnum, and W.J. Birge. An Integrated Assessment of the Biological Effects of Boron to the Rainbow Trout. Chemosphere26(7): 1383-1413.
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	10		NC	mmol/L	LAB	1998. Rowe, R.I., C. Bouzan, S. Nabili, and C.D. Eckhert. The Response of Trout and Zebrafish Embryos to Low and High Boron Concentrations is U-Shaped. Biol. Trace Elem. Res.66(1-3): 261-270.
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	2100	NA	NR	ug/L	LAB	1993. Black, J.A., J.B. Barnum, and W.J. Birge. An Integrated Assessment of the Biological Effects of Boron to the Rainbow Trout. Chemosphere26(7): 1383-1413.
Boric acid (H3BO3)	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	8		NC	mmol/L	LAB	1998. Rowe, R.I., C. Bouzan, S. Nabili, and C.D. Eckhert. The Response of Trout and Zebrafish Embryos to Low and High Boron Concentrations is U-Shaped. Biol. Trace Elem. Res.66(1-3): 261-270.
Boric acid (H3BO3)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	233000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Boric acid (H3BO3)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	279000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Boric acid (H3BO3)	Razorback Sucker	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	360000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Boric acid (H3BO3)	Razorback Sucker	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	216000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Boric acid (H3BO3)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	1.8E+07	NR	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Boric acid (H3BO3)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	1.1E+07	NR	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Boric acid (H3BO3)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	5600000	NR	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Boron sodium oxide (B4Na2O7)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	F	346000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Boron sodium oxide (B4Na2O7)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	F	236000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Boron sodium oxide (B4Na2O7)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	F	104000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Boron sodium oxide (B4Na2O7)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	F	54700*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Boron sodium oxide (B4Na2O7)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	F	51800*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Boric acid (H3BO3)	Zebra Danio	Fish	Fresh	Mortality	LOEL	Not Reported	T	9.2		NC	mmol/L	LAB	1998. Rowe, R.I., C. Bouzan, S. Nabili, and C.D. Eckhert. The Response of Trout and Zebrafish Embryos to Low and High Boron Concentrations is U-Shaped. Biol. Trace Elem. Res.66(1-3): 261-270.
Boric acid (H3BO3)	Zebra Danio	Fish	Fresh	Mortality	NOEL	Not Reported	T	1.2		NC	mmol/L	LAB	1998. Rowe, R.I., C. Bouzan, S. Nabili, and C.D. Eckhert. The Response of Trout and Zebrafish Embryos to Low and High Boron Concentrations is U-Shaped. Biol. Trace Elem. Res.66(1-3): 261-270.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	820	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium chloride (CdCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	6.1	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Cadmium chloride (CdCl2)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	44540	NA	NR	ug/L	LAB	1990. Ghosh, A.R., and P. Chakrabarti. Toxicity of Arsenic and Cadmium to a Freshwater Fish Notopterus notopterus. Environ. Ecol.8(2): 576-579.
Cadmium chloride (CdCl2)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	57870	NA	NR	ug/L	LAB	1990. Ghosh, A.R., and P. Chakrabarti. Toxicity of Arsenic and Cadmium to a Freshwater Fish Notopterus notopterus. Environ. Ecol.8(2): 576-579.
Cadmium chloride (CdCl2)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	69420	NA	NR	ug/L	LAB	1990. Ghosh, A.R., and P. Chakrabarti. Toxicity of Arsenic and Cadmium to a Freshwater Fish Notopterus notopterus. Environ. Ecol.8(2): 576-579.
Cadmium chloride (CdCl2)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	75540	NA	NR	ug/L	LAB	1991. Ghosh, A.R., and P. Chakrabarti. Effects of Cadmium Poisoning on Some Cellular Enzymes in the Stomach, Intestine and Intestinal Caeca of Notopterus notopterus (Pallas): A. In: Proc. Natl. Symp. Freshwater Aquacult. , Zool. Dep. , Burdwan Univ. , Burdwan: 176-178.
Cadmium chloride (CdCl2)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	45000	NR	NR	ug/L	LAB	2002. Sindhe, V.R., M.U. Veeresh, and R.S. Kulkarni. Ovarian Changes in Response to Heavy Metal Exposure to the Fish, Notopterus notopterus (Pallas). J. Environ. Biol.23(2): 137-141.
Cadmium chloride (CdCl2)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	45250	NR	NR	ug/L	LAB	2002. Sindhe, V.R., M.U. Veeresh, and R.S. Kulkarni. Ovarian Changes in Response to Heavy Metal Exposure to the Fish, Notopterus notopterus (Pallas). J. Environ. Biol.23(2): 137-141.
Cadmium chloride (CdCl2)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	61660	NR	NR	ug/L	LAB	2002. Sindhe, V.R., M.U. Veeresh, and R.S. Kulkarni. Ovarian Changes in Response to Heavy Metal Exposure to the Fish, Notopterus notopterus (Pallas). J. Environ. Biol.23(2): 137-141.
Cadmium chloride (CdCl2)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	75540	NA	NR	ug/L	LAB	1990. Ghosh, A.R., and P. Chakrabarti. Toxicity of Arsenic and Cadmium to a Freshwater Fish Notopterus notopterus. Environ. Ecol.8(2): 576-579.
Cadmium	Atlantic Salmon	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Lundebye, A.K., M.H.G. Berntssen, S.E. Wendelaar Bonga, and A. Maage. Biochemical and Physiological Responses in Atlantic Salmon (Salmo salar) Following Dietary Exposure to Copper and Cadmium. Mar. Pollut. Bull.39(1-12): 137-144.
Cadmium	Atlantic Salmon	Fish	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1990. Maage, A.. Comparison of Cadmium Concentrations in Atlantic Salmon (Salmo salar) Fry fed Different Commercial Feeds. Bull. Environ. Contam. Toxicol.44(5): 770-775.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Peterson, R.H., J.L. Metcalfe, and S. Ray. Uptake of Cadmium by Eggs and Alevins of Atlantic Salmon (Salmo salar) as Influenced by Acidic Conditions. Bull. Environ. Contam. Toxicol.34(3): 359-368.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Growth	NR		T	0.47	NA	NR	ug/L	LAB	1982. Rombough, P.J., and E.T. Garside. Cadmium Toxicity and Accumulation in Eggs and Alevins of Atlantic Salmon, Salmo salar. Can. J. Zool.60(8): 2006-2014.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Growth	NR		T	0.2	NA	NR	ug/L	LAB	1983. Peterson, R.H., J.L. Metcalfe, and S. Ray. Effects of Cadmium on Yolk Utilization, Growth, and Survival of Atlantic Salmon Alevins and Newly Feeding Fry. Arch. Environ. Contam. Toxicol.12(1): 37-44.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Growth	NR		T	2	NA	NR	ug/L	LAB	1983. Peterson, R.H., J.L. Metcalfe, and S. Ray. Effects of Cadmium on Yolk Utilization, Growth, and Survival of Atlantic Salmon Alevins and Newly Feeding Fry. Arch. Environ. Contam. Toxicol.12(1): 37-44.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Rombough, P.J., and E.T. Garside. Cadmium Toxicity and Accumulation in Eggs and Alevins of Atlantic Salmon, Salmo salar. Can. J. Zool.60(8): 2006-2014.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Rombough, P.J., and E.T. Garside. Cadmium Toxicity and Accumulation in Eggs and Alevins of Atlantic Salmon, Salmo salar. Can. J. Zool.60(8): 2006-2014.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Rombough, P.J., and E.T. Garside. Cadmium Toxicity and Accumulation in Eggs and Alevins of Atlantic Salmon, Salmo salar. Can. J. Zool.60(8): 2006-2014.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Rombough, P.J., and E.T. Garside. Cadmium Toxicity and Accumulation in Eggs and Alevins of Atlantic Salmon, Salmo salar. Can. J. Zool.60(8): 2006-2014.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1983. Rombough, P.J., and E.T. Garside. The Influence of the Zona Radiata on the Toxicity and Uptake of Cadmium in Embryos of Atlantic Salmon (Salmo salar). Can. J. Zool.61(10): 2338-2343.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	4800	NA	NR	ug/L	LAB	1983. Rombough, P.J., and E.T. Garside. The Influence of the Zona Radiata on the Toxicity and Uptake of Cadmium in Embryos of Atlantic Salmon (Salmo salar). Can. J. Zool.61(10): 2338-2343.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Peterson, R.H., J.L. Metcalfe, and S. Ray. Uptake of Cadmium by Eggs and Alevins of Atlantic Salmon (Salmo salar) as Influenced by Acidic Conditions. Bull. Environ. Contam. Toxicol.34(3): 359-368.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	0.2	NA	NR	ug/L	LAB	1983. Peterson, R.H., J.L. Metcalfe, and S. Ray. Effects of Cadmium on Yolk Utilization, Growth, and Survival of Atlantic Salmon Alevins and Newly Feeding Fry. Arch. Environ. Contam. Toxicol.12(1): 37-44.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	2	NA	NR	ug/L	LAB	1983. Peterson, R.H., J.L. Metcalfe, and S. Ray. Effects of Cadmium on Yolk Utilization, Growth, and Survival of Atlantic Salmon Alevins and Newly Feeding Fry. Arch. Environ. Contam. Toxicol.12(1): 37-44.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	0.2	NA	NR	ug/L	LAB	1983. Peterson, R.H., J.L. Metcalfe, and S. Ray. Effects of Cadmium on Yolk Utilization, Growth, and Survival of Atlantic Salmon Alevins and Newly Feeding Fry. Arch. Environ. Contam. Toxicol.12(1): 37-44.
Cadmium chloride (CdCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	2	NA	NR	ug/L	LAB	1983. Peterson, R.H., J.L. Metcalfe, and S. Ray. Effects of Cadmium on Yolk Utilization, Growth, and Survival of Atlantic Salmon Alevins and Newly Feeding Fry. Arch. Environ. Contam. Toxicol.12(1): 37-44.
Sulfuric acid, Cadmium salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	1*	NA	NR	ug/L	LAB	1976. Peterson, R.H.. Temperature Selection of Juvenile Atlantic Salmon (Salmo salar) as Influenced by Various Toxic Substances. J. Fish. Res. Board Can.33(8): 1722-1730.
Sulfuric acid, Cadmium salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	69.4*	NA	NR	ug/L	LAB	1976. Zitko, V., and W.G. Carson. A Mechanism of the Effects of Water Hardness on the Lethality of Heavy Metals to Fish. Chemosphere5(5): 299-303.
Sulfuric acid, Cadmium salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	73.9*	NA	NR	ug/L	LAB	1976. Zitko, V., and W.G. Carson. A Mechanism of the Effects of Water Hardness on the Lethality of Heavy Metals to Fish. Chemosphere5(5): 299-303.
Cadmium	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	250000	NR	NR	ug/L	LAB	1999. Lundebye, A.K., M.H.G. Berntssen, S.E. Wendelaar Bonga, and A. Maage. Biochemical and Physiological Responses in Atlantic Salmon (Salmo salar) Following Dietary Exposure to Copper and Cadmium. Mar. Pollut. Bull.39(1-12): 137-144.
Cadmium	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium chloride (CdCl2)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	59990	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Cadmium and Copper to a Freshwater Fish Puntius arulius. Environ. Ecol.6(1): 5-8.
Cadmium chloride (CdCl2)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	45700	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Cadmium and Copper to a Freshwater Fish Puntius arulius. Environ. Ecol.6(1): 5-8.
Cadmium chloride (CdCl2)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	41700	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Cadmium and Copper to a Freshwater Fish Puntius arulius. Environ. Ecol.6(1): 5-8.
Cadmium chloride (CdCl2)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	39000	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Cadmium and Copper to a Freshwater Fish Puntius arulius. Environ. Ecol.6(1): 5-8.
Cadmium chloride (CdCl2)	Barb	Fish	Fresh	Reproduction	NR	Testes	T	100000	NR	NR	ug/L	LAB	1991. Kumari, M., and N.H.G. Dutt. Cadmium-Induced Histomorphological Changes in the Testis and Pituitary Gonadotrophic Hormone Secreting Cells of the Cyprinid Puntius sarana. Boll. Zool.58: 71-76.
Cadmium chloride (CdCl2)	Barb	Fish	Fresh	Reproduction	NR	Testes	T	100000	NR	NR	ug/L	LAB	1991. Kumari, M., and N.H.G. Dutt. Cadmium-Induced Histomorphological Changes in the Testis and Pituitary Gonadotrophic Hormone Secreting Cells of the Cyprinid Puntius sarana. Boll. Zool.58: 71-76.
Cadmium chloride (CdCl2)	Barb	Fish	Fresh	Reproduction	NR	Testes	T	100000	NR	NR	ug/L	LAB	1991. Kumari, M., and N.H.G. Dutt. Cadmium-Induced Histomorphological Changes in the Testis and Pituitary Gonadotrophic Hormone Secreting Cells of the Cyprinid Puntius sarana. Boll. Zool.58: 71-76.
Cadmium chloride (CdCl2)	Barb	Fish	Fresh	Reproduction	NR	Testes	T	NR	NR	NR	ug/L	LAB	1991. Kumari, M., and N.H.G. Dutt. Cadmium-Induced Histomorphological Changes in the Testis and Pituitary Gonadotrophic Hormone Secreting Cells of the Cyprinid Puntius sarana. Boll. Zool.58: 71-76.
Cadmium chloride (CdCl2)	Barb	Fish	Fresh	Reproduction	NR	Testes	T	NR	NR	NR	ug/L	LAB	1991. Kumari, M., and N.H.G. Dutt. Cadmium-Induced Histomorphological Changes in the Testis and Pituitary Gonadotrophic Hormone Secreting Cells of the Cyprinid Puntius sarana. Boll. Zool.58: 71-76.
Cadmium chloride (CdCl2)	Barb	Fish	Fresh	Reproduction	NR	Testes	T	NR	NR	NR	ug/L	LAB	1991. Kumari, M., and N.H.G. Dutt. Cadmium-Induced Histomorphological Changes in the Testis and Pituitary Gonadotrophic Hormone Secreting Cells of the Cyprinid Puntius sarana. Boll. Zool.58: 71-76.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Growth	NR		T	12700	NA	NR	ug/L	LAB	1986. Versteeg, D.J., and J.P. Giesy. The Histological and Biochemical Effects of Cadmium Exposure in the Bluegill Sunfish (Lepomis macrochirus). Ecotoxicol. Environ. Saf.11(1): 31-43.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Growth	NR		T	3900	NA	NR	ug/L	LAB	1986. Versteeg, D.J., and J.P. Giesy. The Histological and Biochemical Effects of Cadmium Exposure in the Bluegill Sunfish (Lepomis macrochirus). Ecotoxicol. Environ. Saf.11(1): 31-43.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Growth	NR		T	80	NA	NR	ug/L	LAB	1974. Eaton, J.G.. Chronic Cadmium Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Trans. Am. Fish. Soc.103(4): 729-735.
Cadmium	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	21100	NR	NR	ug/L	LAB	1980. Eaton, J.G.. Chronic Cadmiun Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Memo to C.E.Stephan, U.S.EPA, Duluth, MN: 1 p..
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	3100	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	3100	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	4500	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	7780	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	7900	NR	NR	ug/L	LAB	1995. Abdelghani, A.A., Y.V. Pramar, T.K. Mandal, P.B. Tchounwou, and L. Heyer. Levels and Toxicities of Selected Inorganic and Organic Contaminants in a Swamp Environment. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes30(5): 717-731.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	3100	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	3100	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	7330	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	6470	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	6100	NR	NR	ug/L	LAB	1995. Abdelghani, A.A., Y.V. Pramar, T.K. Mandal, P.B. Tchounwou, and L. Heyer. Levels and Toxicities of Selected Inorganic and Organic Contaminants in a Swamp Environment. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes30(5): 717-731.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1981. Bishop, W.E., and A.W. McIntosh. Acute Lethality and Effects of Sublethal Cadmium Exposure on Ventilation Frequency and Cough Rate of Bluegill (Lepomis macrochirus). Arch. Environ. Contam. Toxicol.10: 519-530.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	8810	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	11200	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	76300	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	48200	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	7410	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	48200	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	6620	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1980. Black, J.A., and W.J. Birge. An Avoidance Response Bioassay for Aquatic Pollutants. Res.Report No.123, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 34-180490.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	21100	NA	NR	ug/L	LAB	1974. Eaton, J.G.. Chronic Cadmium Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Trans. Am. Fish. Soc.103(4): 729-735.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	4560	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	2760	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	1560*	NA	NR	ug/L	LAB	1975. Rausina, G., J.W. Goode, M.L. Keplinger, and J.C. Calandra. Four-Day Static Fish Toxicity Studies Conducted with Thirteen Cadmium Pigments in Three Species of Freshwater Fish. Toxicol. Appl. Pharmacol.33(1): 188.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	1940	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	NOEC	Not Reported	T	32000	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	NOEC	Not Reported	T	4200	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1979. Giesy, J.P.,Jr., H.J. Kania, J.W. Bowling, R.L. Knight, S. Mashburn, and S. Clarkin. Fate and Biological Effects of Cadmium Introduced into Channel Microcosms. EPA-600/3-79-039, Savannah River Ecol.Lab., Inst.of Ecol., Univ.of Georgia, Aiken, SC: 157 p..
Cadmium chloride (CdCl2)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	3900	NA	NR	ug/L	LAB	1986. Versteeg, D.J., and J.P. Giesy. The Histological and Biochemical Effects of Cadmium Exposure in the Bluegill Sunfish (Lepomis macrochirus). Ecotoxicol. Environ. Saf.11(1): 31-43.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1978. Ellgaard, E.G., J.E. Tusa, and A.A.,Jr. Malizia. Locomotor Activity of the Bluegill Lepomis macrochirus: Hyperactivity Induced by Sublethal Concentrations of Cadmium, Chromium and Zinc. J. Fish Biol.1(1): 19-23.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	31	NA	NR	ug/L	LAB	1974. Eaton, J.G.. Chronic Cadmium Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Trans. Am. Fish. Soc.103(4): 729-735.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	2140	NA	NR	ug/L	LAB	1974. Eaton, J.G.. Chronic Cadmium Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Trans. Am. Fish. Soc.103(4): 729-735.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	239	NA	NR	ug/L	LAB	1974. Eaton, J.G.. Chronic Cadmium Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Trans. Am. Fish. Soc.103(4): 729-735.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	31	NA	NR	ug/L	LAB	1974. Eaton, J.G.. Chronic Cadmium Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Trans. Am. Fish. Soc.103(4): 729-735.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	80	NA	NR	ug/L	LAB	1974. Eaton, J.G.. Chronic Cadmium Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Trans. Am. Fish. Soc.103(4): 729-735.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	80	NA	NR	ug/L	LAB	1974. Eaton, J.G.. Chronic Cadmium Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Trans. Am. Fish. Soc.103(4): 729-735.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	80	NA	NR	ug/L	LAB	1974. Eaton, J.G.. Chronic Cadmium Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Trans. Am. Fish. Soc.103(4): 729-735.
Cadmium	Bluegill	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1973. Brown, E.R., L. Keith, J.J. Hazdra, and T. Arndt. Tumors in Fish Caught in Polluted Waters: Possible Explanations. In: Y.Ito and R.M.Dutcher (Eds.), Comparative Leukemia Research 1973, Leukemogenesis, Bibl.Haematol.No.40, Univ.of Tokyo Press, Tokyo/Karger, Basel: 47-57.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2140	NA	NR	ug/L	LAB	1974. Eaton, J.G.. Chronic Cadmium Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Trans. Am. Fish. Soc.103(4): 729-735.
Sulfuric acid, Cadmium salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	757	NA	NR	ug/L	LAB	1974. Eaton, J.G.. Chronic Cadmium Toxicity to the Bluegill (Lepomis macrochirus Rafinesque). Trans. Am. Fish. Soc.103(4): 729-735.
Cadmium	Bony Fishes	Fish	Fresh	Mortality	NR	Not Reported	T	0.03	NA	NR	mg	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium chloride (CdCl2)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	148	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	168	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Cadmium	Borneo Mullet	Fish	NR	Mortality	LC50	Not Reported	T	2940	NA	NR	ug/L	LAB	1987. Nammalwar, P.. Pollution Impact and Management of the Coastal Estuaries Around Madras, India. In: N.B.Nair (Ed.), Proc.of the Natl.Semin.on Estuarine Manage., June 4-5, 1987, Trivandrum, India: 190-193.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	3.4	NA	NR	ug/L	LAB	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Toxic Effects of Cadmium on Three Generations of Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.105(4): 550-560.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Toxic Effects of Cadmium on Three Generations of Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.105(4): 550-560.
Cadmium	Brook Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	132	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Brook Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	18	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	1.7	NA	NR	ug/L	LAB	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Toxic Effects of Cadmium on Three Generations of Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.105(4): 550-560.
Cadmium	Brook Trout	Fish	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1988. Gingerich, W.H., R.M. Elsbury, and M.T. Steingraeber. Effects of Cadmium on Hatching Success, Growth, and Osteological Development of Larval Brook Trout (Salvelinus fontinalis) in Soft, Acidic Waters. Aquat. Toxicol.11(3-4): 404-405.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Growth	NR		T	0.7	NA	NR	ug/L	LAB	1975. Christensen, G.M.. Biochemical Effects of Methylmercuric Chloride, Cadmium Chloride, and Lead Nitrate on Embryos and Alevins of the Brook Trout, Salvelinus fontinalis. Toxicol. Appl. Pharmacol.32: 191-197.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Growth	NR		T	1	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Growth	NR		T	3	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Cadmium	Brook Trout	Fish	Fresh	Mortality	IC50	Not Reported	T	110	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Brook Trout	Fish	Fresh	Mortality	IC50	Not Reported	T	14	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6160	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5240	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5080	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.5	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	59	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9.5	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	34	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	41	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.3	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6.8	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.4	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	29	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3.8	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4.4	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.3	NA	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Cadmium	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	132	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	18	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	3.4	NA	NR	ug/L	LAB	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Toxic Effects of Cadmium on Three Generations of Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.105(4): 550-560.
Cadmium	Brook Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	12	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Brook Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	91	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Toxic Effects of Cadmium on Three Generations of Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.105(4): 550-560.
Cadmium	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	62	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	8	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.7	NA	NR	ug/L	LAB	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Toxic Effects of Cadmium on Three Generations of Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.105(4): 550-560.
Cadmium	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Gingerich, W.H., R.M. Elsbury, and M.T. Steingraeber. Effects of Cadmium on Hatching Success, Growth, and Osteological Development of Larval Brook Trout (Salvelinus fontinalis) in Soft, Acidic Waters. Aquat. Toxicol.11(3-4): 404-405.
Cadmium	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Toxic Effects of Cadmium on Three Generations of Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.105(4): 550-560.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1980. Drummond, R.A., and D.A. Benoit. Toxicity of Cadmium to Fish - Some Observations on the Influence of Experimental Procedures. Manuscr., U.S.EPA, Duluth, MN: 8 p..
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1980. Drummond, R.A., and D.A. Benoit. Toxicity of Cadmium to Fish - Some Observations on the Influence of Experimental Procedures. Manuscr., U.S.EPA, Duluth, MN: 8 p..
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1980. Drummond, R.A., and D.A. Benoit. Toxicity of Cadmium to Fish - Some Observations on the Influence of Experimental Procedures. Manuscr., U.S.EPA, Duluth, MN: 8 p..
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Toxic Effects of Cadmium on Three Generations of Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.105(4): 550-560.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	12	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	7	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Cadmium	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	25000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	6000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	25000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Toxic Effects of Cadmium on Three Generations of Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.105(4): 550-560.
Sulfuric acid, Cadmium salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR	D	NR	ug/L	LAB	1979. Carroll, J.J., S.J. Ellis, and W.S. Oliver. Influences of Hardness Constituents on the Acute Toxicity of Cadmium to Brook Trout (Salvelinus fontinalis). Bull. Environ. Contam. Toxicol.22(4-5): 575-581.
Cadmium chloride (CdCl2)	Brook Trout	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Toxic Effects of Cadmium on Three Generations of Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.105(4): 550-560.
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Growth	NR	Whole Organism	T	2000	NR	NR	ug/L	LAB	1981. O'Neill, J.G.. Effects of Intraperitoneal Lead and Cadmium on the Humoral Immune Response of Salmo trutta. Bull. Environ. Contam. Toxicol.27(1): 42-48.
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Growth	NR	Whole Organism	T	1000	NR	NR	ug/L	LAB	1981. O'Neill, J.G.. Effects of Intraperitoneal Lead and Cadmium on the Humoral Immune Response of Salmo trutta. Bull. Environ. Contam. Toxicol.27(1): 42-48.
Cadmium chloride (CdCl2)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.4	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15.1	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.87		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.31		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.37		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.69		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4.07		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4.09		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4.65		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1.78		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	0.7		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	NR		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	1.33		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	0.4		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR		NR	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.2		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	NR		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Cadmium	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1.7		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Cadmium chloride (CdCl2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	3.8	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Embryonic and Larval Development of Brown Trout, Salmo trutta L.: Exposure to Trace Metal Mixtures in Soft Water. J. Fish Biol.38: 773-787.
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Brown, V., D. Shurben, W. Miller, and M. Crane. Cadmium Toxicity to Rainbow Trout Oncorhynchus mykiss Walbaum and Brown Trout Salmo trutta L. over Extended Exposure Periods. Ecotoxicol. Environ. Saf.29: 38-46.
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Brown, V., D. Shurben, W. Miller, and M. Crane. Cadmium Toxicity to Rainbow Trout Oncorhynchus mykiss Walbaum and Brown Trout Salmo trutta L. over Extended Exposure Periods. Ecotoxicol. Environ. Saf.29: 38-46.
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2.73		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	12.6		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000	NR	NR	ug/L	LAB	1981. O'Neill, J.G.. Effects of Intraperitoneal Lead and Cadmium on the Humoral Immune Response of Salmo trutta. Bull. Environ. Contam. Toxicol.27(1): 42-48.
Cadmium chloride (CdCl2)	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1700	NR	NR	ug/L	LAB	1999. Sanchez-Galan, S., A.R. Linde, and E. Garcia-Vazquez. Brown Trout and European Minnow as Target Species for Genotoxicity Tests: Differential Sensitivity to Heavy Metals. Ecotoxicol. Environ. Saf.43(3): 301-304.
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.2		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NR	NR	ug/L	LAB	1981. O'Neill, J.G.. Effects of Intraperitoneal Lead and Cadmium on the Humoral Immune Response of Salmo trutta. Bull. Environ. Contam. Toxicol.27(1): 42-48.
Cadmium chloride (CdCl2)	Brown Trout	Fish	Fresh	Reproduction	LOEC	Sperm	T	25000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Cadmium chloride (CdCl2)	Brown Trout	Fish	Fresh	Reproduction	NOEC	Sperm	T	25000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Cadmium chloride (CdCl2)	Brown Trout	Fish	Fresh	Reproduction	NOEC	Sperm	T	25000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid, Cadmium salt (1:1)	Brown Trout	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Brown, V., D. Shurben, W. Miller, and M. Crane. Cadmium Toxicity to Rainbow Trout Oncorhynchus mykiss Walbaum and Brown Trout Salmo trutta L. over Extended Exposure Periods. Ecotoxicol. Environ. Saf.29: 38-46.
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.62	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.63	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.72	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.72	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.99	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	1.36	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	2.2	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	3.91	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.63	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.69	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.72	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.9	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	1.84	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	3.64	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.9	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.91	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.96	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.28	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.29	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.89	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3.6	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6.06	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6.6	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.83	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.83	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.83	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.88	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.9	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.9	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.96	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.99	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.12	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.22	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.41	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.66	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.91	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.23	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.8	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6.03	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.9	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.9	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Burbot	Fish	Fresh	Reproduction	LOEC	Sperm	T	25000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Cadmium chloride (CdCl2)	Burbot	Fish	Fresh	Reproduction	LOEC	Sperm	T	25000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Cadmium chloride (CdCl2)	Burbot	Fish	Fresh	Reproduction	NOEC	Sperm	T	25000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid, Cadmium salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3680	NR	NR	ug/L	LAB	1982. Kapur, K., and N.A. Yadav. The Effects of Certain Heavy Metal Salts on the Development of Eggs in Common Carp, Cyprinus carpio var. communis. Acta Hydrochim. Hydrobiol.10(5): 517-522.
Cadmium chloride (CdCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	5300	NA	NR	ug/L	LAB	1984. Verma, S.R., I.P. Tonk, A.K. Gupta, and M. Saxena. Evaluation of an Application Factor for Determining the Safe Concentration of Agricultural and Industrial Chemicals. Water Res.18(1): 111-115.
Cadmium chloride (CdCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. Verma, S.R., I.P. Tonk, A.K. Gupta, and M. Saxena. Evaluation of an Application Factor for Determining the Safe Concentration of Agricultural and Industrial Chemicals. Water Res.18(1): 111-115.
Cadmium chloride (CdCl2)	Catfish	Fish	Fresh	Growth	NOEC	Whole Organism	T	1000	NR	NR	ug/L	LAB	2002. Al-Arabi, S.A.M., and A. Goksoyr. Cytochrome P4501A Responses in Two Tropical Fish Species, Riverine Catfish (Rita rita) and Marine Mudfish (Apocryptes bato). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.131(1): 61-71.
Cadmium chloride (CdCl2)	Catfish	Fish	Fresh	Growth	NOEC	Whole Organism	T	1000	NR	NR	ug/L	LAB	2002. Al-Arabi, S.A.M., and A. Goksoyr. Cytochrome P4501A Responses in Two Tropical Fish Species, Riverine Catfish (Rita rita) and Marine Mudfish (Apocryptes bato). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.131(1): 61-71.
Cadmium chloride (CdCl2)	Catfish	Fish	Fresh	Growth	NR	Whole Organism	T	1000	NR	NR	ug/L	LAB	2002. Al-Arabi, S.A.M., and A. Goksoyr. Cytochrome P4501A Responses in Two Tropical Fish Species, Riverine Catfish (Rita rita) and Marine Mudfish (Apocryptes bato). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.131(1): 61-71.
Cadmium chloride (CdCl2)	Catla	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1993. Sarkar, S.K.. Role of Cadmium Chloride on Fish and Aquatic Ecosystem. ASFA 1988-1996 CDROM, Prepared by SilverPlatter Information Inc. , Updated 1996:AN 2985087 (ABS) / Fish. Chimes12(12): 20 - 21, 23.
Nitric acid, Cadmium salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	3700	NA	NR	ug/L	LAB	1998. Kanagaraj, M.K., R. Mathew, and R. Manavalaramanujam. Effect of Cadmium Nitrate on Plasm Electrolytes of the Fish, Catla catla. J. Environ. Biol.19(2): 107-110.
Cadmium chloride (CdCl2)	Catla	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1993. Sarkar, S.K.. Role of Cadmium Chloride on Fish and Aquatic Ecosystem. ASFA 1988-1996 CDROM, Prepared by SilverPlatter Information Inc. , Updated 1996:AN 2985087 (ABS) / Fish. Chimes12(12): 20 - 21, 23.
Cadmium chloride (CdCl2)	Catla	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1993. Sarkar, S.K.. Role of Cadmium Chloride on Fish and Aquatic Ecosystem. ASFA 1988-1996 CDROM, Prepared by SilverPlatter Information Inc. , Updated 1996:AN 2985087 (ABS) / Fish. Chimes12(12): 20 - 21, 23.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Growth	NR		T	12	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Growth	NR		T	17	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	10200	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	5020	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4610	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4480	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	7940	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	338.3	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	2170*	NA	NR	ug/L	LAB	1975. Rausina, G., J.W. Goode, M.L. Keplinger, and J.C. Calandra. Four-Day Static Fish Toxicity Studies Conducted with Thirteen Cadmium Pigments in Three Species of Freshwater Fish. Toxicol. Appl. Pharmacol.33(1): 188.
Cadmium	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	11	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	17	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Cadmium chloride (CdCl2)	Channel Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	0.0001	NA	NR	ug/L	LAB	1991. Bentley, P.J.. Accumulation of Cadmium by Channel Catfish (Ictalurus punctatus): Influx from Environmental Solutions. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.99(3): 527-529.
Nitric acid, Cadmium salt	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	3540*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Nitric acid, Cadmium salt	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	860*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Nitric acid, Cadmium salt	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	3080*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Nitric acid, Cadmium salt	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	2850*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Nitric acid, Cadmium salt	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	2270*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Nitric acid, Cadmium salt	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	2020*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Nitric acid, Cadmium salt	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	1600*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Nitric acid, Cadmium salt	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	1430*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Cadmium	Chinook Salmon	Fish	Fresh	Growth	NOEC	Not Reported	D	1.88	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Chinook Salmon	Fish	Fresh	Growth	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Cadmium	Chinook Salmon	Fish	Fresh	Mortality	LC10	Not Reported	D	1.2	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Cadmium	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	1.41	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Cadmium chloride (CdCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1.8	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Cadmium chloride (CdCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	3.5	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Cadmium chloride (CdCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Cadmium chloride (CdCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	57	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Cadmium chloride (CdCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1.6	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Cadmium chloride (CdCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Cadmium chloride (CdCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	2.3	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Sulfuric acid, Cadmium salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	1.1	NA	NR	ug/L	LAB	1982. Finlayson, B.J., and K.M. Verrue. Toxicities of Copper, Zinc, and Cadmium Mixtures to Juvenile Chinook Salmon. Trans. Am. Fish. Soc.111(5): 645-650.
Cadmium	Chinook Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	D	1.88	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Cadmium	Chinook Salmon	Fish	Fresh	Mortality	MATC	Not Reported	D	1.57	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Cadmium	Chinook Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	D	1.33	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Cadmium chloride (CdCl2)	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Cadmium chloride (CdCl2)	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Cadmium chloride (CdCl2)	Chub	Fish	Fresh	Reproduction	LOEC	Sperm	T	200	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Cadmium chloride (CdCl2)	Chub	Fish	Fresh	Reproduction	NOEC	Sperm	T	200	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Cadmium chloride (CdCl2)	Chub	Fish	Fresh	Reproduction	NR	Sperm	T	200	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid, Cadmium salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC10	Not Reported	T	47		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid, Cadmium salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid, Cadmium salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	91		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Cadmium chloride (CdCl2)	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	300000*	NA	NR	ug/L	LAB	1988. Banerjee, V., and K. Kumari. Effect of Zinc, Mercury and Cadmium on Erythrocyte and Related Parameters in the Fish Anabas testudineus. Environ. Ecol.6(3): 737-739.
Cadmium chloride (CdCl2)	Climbing Perch	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1989. Jana, S., and S.S. Sahana. Sensitivity of the Freshwater Fishes Clarias batrachus and Anabas testudineus to Heavy Metals. Environ. Ecol.7(2): 265-270.
Cadmium	Coho Salmon,Silver Salmon	Fish	Fresh	Growth	NR	Not Reported	T	50	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Growth	NR		T	3.98	NA	NR	ug/L	LAB	1978. Lorz, H.W., R.H. Williams, and C.A. Fustish. Effects of Several Metals on Smolting of Coho Salmon. EPA-600/3-78-090, U.S.EPA, Corvallis, OR: 84 p..
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	10.4	NA	NR	ug/L	LAB	1978. Lorz, H.W., R.H. Williams, and C.A. Fustish. Effects of Several Metals on Smolting of Coho Salmon. EPA-600/3-78-090, U.S.EPA, Corvallis, OR: 84 p..
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NA	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1.5	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	3.4	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	4	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	6	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	3.7	NR	NR	ug/L	LAB	1978. Chapman, G.A., and D.G. Stevens. Acutely Lethal Levels of Cadmium, Copper, and Zinc to Adult Male Coho Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 837-840.
Cadmium	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Schreck, C.B., and H.W. Lorz. Stress Response of Coho Salmon (Oncorhynchus kisutch) Elicited by Cadmium and Copper and Potential Use of Cortisol as an Indicator of Stress. J. Fish. Res. Board Can.35(8): 1124-1129.
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	3.98	NA	NR	ug/L	LAB	1978. Lorz, H.W., R.H. Williams, and C.A. Fustish. Effects of Several Metals on Smolting of Coho Salmon. EPA-600/3-78-090, U.S.EPA, Corvallis, OR: 84 p..
Cadmium	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Cadmium chloride (CdCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	4.46	NR	NR	ug/L	LAB	1978. Schreck, C.B., and H.W. Lorz. Stress Response of Coho Salmon (Oncorhynchus kisutch) Elicited by Cadmium and Copper and Potential Use of Cortisol as an Indicator of Stress. J. Fish. Res. Board Can.35(8): 1124-1129.
Cadmium chloride (CdCl2)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	108	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Cadmium chloride (CdCl2)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	78	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Cadmium	Common Carp	Fish	Fresh	Growth	NOEC	Whole Organism	T	440	NR	NR	ug/L	LAB	1998. De conto Cinier, C., M. Petit-Ramel, R. Faure, and M. Bortolato. Cadmium Accumulation and Metallothionein Biosynthesis in Cyprinus carpio Tissues. Bull. Environ. Contam. Toxicol.61(6): 793-799.
Cadmium	Common Carp	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Witeska, M., B. Jezierska, and J. Chaber. The Influence of Cadmium on Common Carp Embryos and Larvae. Aquaculture129(1-4): 129-132.
Cadmium	Common Carp	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1999. De conto Cinier, C., M. Petit-Ramel, R. Faure, D. Garin, and Y. Bouvet. Kinetics of Cadmium Accumulation and Elimination in Carp Cyprinus carpio Tissues. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.122: 345-352.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1993. Sarkar, S.K.. Role of Cadmium Chloride on Fish and Aquatic Ecosystem. ASFA 1988-1996 CDROM, Prepared by SilverPlatter Information Inc. , Updated 1996:AN 2985087 (ABS) / Fish. Chimes12(12): 20 - 21, 23.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Yoshitomi, T., J. Koyama, A. Lida, N. Okamoto, and Y. Ikeda. Cadmium-Induced Scale Deformation in Carp (Cyprinus carpio). Bull. Environ. Contam. Toxicol.60: 639-644.
Cadmium chloride (CdCl2)	Common Carp	Fish	NR	Growth	NR	Not Reported	T	25*	NA	NR	ug/L	LAB	1985. Koyama, J., K. Yamawaki, M. Maita, K. Wakabayashi, Y. Ikeda, and H. Ozaki. The Effects of Cadmium on the Activities of Tissue Enzymes of Fish. Nippon Suisan Gakkaishi51(8): 1255-1260.
Cadmium	Common Carp	Fish	Fresh	Mortality	LC5	Not Reported	T	6300	NR	NR	ug/L	LAB	1986. Wani, G.P.. Toxicity of Heavy Metals to Embryonic Stages of Cyprinus carpio communis Linn. Pollut. Res.5(2): 47-51.
Cadmium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	450	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	NR	NR	ug/L	LAB	1999. Murugappan, R.M., M. Muthusamy, and M. Gunasundari. Genotoxicity and Bioaccumulation of BHC and Cadmium on the Freshwater Fish, Cyprinus carpio. J. Environ. Biol.20(4): 313-316.
Cadmium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NA	NR	ug/L	LAB	1995. Witeska, M., B. Jezierska, and J. Chaber. The Influence of Cadmium on Common Carp Embryos and Larvae. Aquaculture129(1-4): 129-132.
Cadmium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1995. Witeska, M., B. Jezierska, and J. Chaber. The Influence of Cadmium on Common Carp Embryos and Larvae. Aquaculture129(1-4): 129-132.
Cadmium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1995. Witeska, M., B. Jezierska, and J. Chaber. The Influence of Cadmium on Common Carp Embryos and Larvae. Aquaculture129(1-4): 129-132.
Cadmium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	21070	NA	NR	ug/L	LAB	1993. Sovenyi, J., and J. Szakolczai. Studies on the Toxic and Immunosuppressive Effects of Cadmium on the Common Carp. Acta Vet. Hung.41(3-4): 415-426.
Cadmium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	17050	NA	NR	ug/L	LAB	1993. Suresh, A., B. Sivaramakrishna, and K. Radhakrishnaiah. Effect of Lethal and Sublethal Concentrations of Cadmium on Energetics in the Gills of Fry and Fingerlings of Cyprinus carpio. Bull. Environ. Contam. Toxicol.51(6): 920-926.
Cadmium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4260	NA	NR	ug/L	LAB	1993. Suresh, A., B. Sivaramakrishna, and K. Radhakrishnaiah. Effect of Lethal and Sublethal Concentrations of Cadmium on Energetics in the Gills of Fry and Fingerlings of Cyprinus carpio. Bull. Environ. Contam. Toxicol.51(6): 920-926.
Cadmium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	165000	NR	NR	ug/L	LAB	1996. Dutta, T.K., and A. Kaviraj. Effects of Lime Acclimation on the Susceptibility of Two Freshwater Teleosts and One Oligochaete Worm to Metallic Pollutant Cadmium. Folia Biol.44(3-4): 143-148.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	11000		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	13600		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	7700		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	9700		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	5000		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	8500		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1900		NC	ug/L	LAB	1984. Cha, S.S., and J.H. Shim. Toxicity of Heavy Metal Ions on Carp (Cyprinus carpio) Eggs. Proc.Coll.Nat.Sci.(Seoul)9(2): 151-156.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	5012	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1979. Chouikhi, A.. Choice and Set Up of the Food Chains in Freshwater in Order to Show the Bioaccumulation Character of a Pollutant. OECD-IRCHA Universite Paris-Sud, Unite d'Enseignement et de Recherche d'Hygiene et Protection de l'Homme et de son Environnement.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3422	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3640	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	5012	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	570	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3095	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3143	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4936	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	530	NA	NR	ug/L	LAB	1997. Ramesha, A.M., T.R.C. Gupta, C. Lingdhal, K.V.B. Kumar, G. Gowda, and K.S. Udupa. Combined Toxicity of Mercury and Cadmium to the Common Carp Cyprinus carpio (Linn.). Environ. Ecol.15(1): 194-198.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	530	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	5500	NA	NR	ug/L	LAB	1979. Chouikhi, A.. Choice and Set Up of the Food Chains in Freshwater in Order to Show the Bioaccumulation Character of a Pollutant. OECD-IRCHA Universite Paris-Sud, Unite d'Enseignement et de Recherche d'Hygiene et Protection de l'Homme et de son Environnement.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3176	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3980	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4702	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2844	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3857	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4616	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2840	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3132	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4559	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	216450	NR	NR	ug/L	LAB	1994. Das, B.K., and A. Kaviraj. Individual and Interactive Lethal Toxicity of Cadmium, Potassium Permanganate and Cobalt Chloride to Fish, Worm and Plankton. Geobios21(4): 223-227.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	7925	NR	NR	ug/L	LAB	1993. El-Bouhy, Z., A.M. Alkelch, G. Saleh, and A.M. Ali. Effects of Heavy Metals intoxication on Some Fresh Water Fish. Zag.J.Pharm.Sci.2(2): 73-90.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1997. Ramesha, A.M., T.R.C. Gupta, C. Lingdhal, K.V.B. Kumar, G. Gowda, and K.S. Udupa. Combined Toxicity of Mercury and Cadmium to the Common Carp Cyprinus carpio (Linn.). Environ. Ecol.15(1): 194-198.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2840	NA	NR	ug/L	LAB	1997. Ramesha, A.M., T.R.C. Gupta, C. Lingdhal, K.V.B. Kumar, G. Gowda, and K.S. Udupa. Combined Toxicity of Mercury and Cadmium to the Common Carp Cyprinus carpio (Linn.). Environ. Ecol.15(1): 194-198.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2840	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2910	NA	NR	ug/L	LAB	1997. Ramesha, A.M., T.R.C. Gupta, C. Lingdhal, K.V.B. Kumar, G. Gowda, and K.S. Udupa. Combined Toxicity of Mercury and Cadmium to the Common Carp Cyprinus carpio (Linn.). Environ. Ecol.15(1): 194-198.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2913	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4559	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4560	NA	NR	ug/L	LAB	1997. Ramesha, A.M., T.R.C. Gupta, C. Lingdhal, K.V.B. Kumar, G. Gowda, and K.S. Udupa. Combined Toxicity of Mercury and Cadmium to the Common Carp Cyprinus carpio (Linn.). Environ. Ecol.15(1): 194-198.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	6120	NA	NR	ug/L	LAB	1993. Alkahem, H.F.. Ethological Responses and Changes in Hemoglobin and Glycogen Content of the Common Carp, Cyprinus carpio, Exposed to Cadmium. Asian Fish. Sci.6(1): 81-90.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	5.1	NA	NR	ug/L	LAB	1981. Verma, S.R., I.P. Tonk, and R.C. Dalela. Determination of the Maximum Acceptable Toxicant Concentration (MATC) and the Safe Concentration for Certain Aquatic Pollutants. Acta Hydrochim. Hydrobiol.9(3): 247-254.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4800	NA	NR	ug/L	LAB	1979. Chouikhi, A.. Choice and Set Up of the Food Chains in Freshwater in Order to Show the Bioaccumulation Character of a Pollutant. OECD-IRCHA Universite Paris-Sud, Unite d'Enseignement et de Recherche d'Hygiene et Protection de l'Homme et de son Environnement.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	138.9	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	17100	NA	NR	ug/L	LAB	1993. Suresh, A., B. Sivaramakrishna, and K. Radhakrishnaiah. Patterns of Cadmium Accumulation in the Organs of Fry and Fingerlings of Freshwater Fish Cyprinus carpio Following Cadmium Exposure. Chemosphere26(5): 945-953.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1993. Suresh, A., B. Sivaramakrishna, and K. Radhakrishnaiah. Patterns of Cadmium Accumulation in the Organs of Fry and Fingerlings of Freshwater Fish Cyprinus carpio Following Cadmium Exposure. Chemosphere26(5): 945-953.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	123130	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	220770	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	226030	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	234160	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	70169	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	72518	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	72680	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	74157	NR	NR	ug/L	LAB	1996. Ghosal, T.K., and A. Kaviraj. Influence of Poultry Litter on the Toxicity of Cadmium to Aquatic Organisms. Bull. Environ. Contam. Toxicol.57(6): 1009-1015.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	17100	NA	NR	ug/L	LAB	1995. Suresh, A., B. Sivaramakrishna, and K. Radhakrishnaiah. Cadmium Induced Changes in Ion Levels and ATPase Activities in the Muscle of the Fry and Fingerlings of the Freshwater Fish, Cyprinus carpio. Chemosphere30(2): 367-375.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1995. Suresh, A., B. Sivaramakrishna, and K. Radhakrishnaiah. Cadmium Induced Changes in Ion Levels and ATPase Activities in the Muscle of the Fry and Fingerlings of the Freshwater Fish, Cyprinus carpio. Chemosphere30(2): 367-375.
Cadmium	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Witeska, M., B. Jezierska, and J. Chaber. The Influence of Cadmium on Common Carp Embryos and Larvae. Aquaculture129(1-4): 129-132.
Cadmium	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1993. Sharma, A., and M.S. Sharma. Vertebral Defects in Lebistes reticulatus (Peters) and Cyprinus carpio (Linnaeus) Exposed to Heavy Metals. Pollut. Res.12(3): 139-143.
Cadmium	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Witeska, M., B. Jezierska, and J. Chaber. The Influence of Cadmium on Common Carp Embryos and Larvae. Aquaculture129(1-4): 129-132.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Ramesha, A.M., T.R.C. Guptha, R.J. Katti, G. Gowda, and C. Lingdhal. Toxicity of Cadmium to Common Carp Cyprinus carpio (Linn.). Environ. Ecol.14(2): 329-333.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T		NR	NR	ug/L	LAB	1986. Wani, G.P.. Toxicity of Heavy Metals to Embryonic Stages of Cyprinus carpio communis Linn. Pollut. Res.5(2): 47-51.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	50	NA	NR	ug/L	LAB	1980. Muramoto, S.. Decrease in Cadmium Concentration in a Cd-Contaminated Fish by Short-Term Exposure to EDTA. Bull. Environ. Contam. Toxicol.25(5): 828-831.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	7925	NR	NR	ug/L	LAB	1993. El-Bouhy, Z., A.M. Alkelch, G. Saleh, and A.M. Ali. Effects of Heavy Metals intoxication on Some Fresh Water Fish. Zag.J.Pharm.Sci.2(2): 73-90.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1993. Sarkar, S.K.. Role of Cadmium Chloride on Fish and Aquatic Ecosystem. ASFA 1988-1996 CDROM, Prepared by SilverPlatter Information Inc. , Updated 1996:AN 2985087 (ABS) / Fish. Chimes12(12): 20 - 21, 23.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (EDTA, DTPA) on the Toxcity of Cadmium to Fish at Chronic Levels. Bull. Environ. Contam. Toxicol.26(5): 641-646.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (EDTA, DTPA) on the Toxcity of Cadmium to Fish at Chronic Levels. Bull. Environ. Contam. Toxicol.26(5): 641-646.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (EDTA, DTPA) on the Toxcity of Cadmium to Fish at Chronic Levels. Bull. Environ. Contam. Toxicol.26(5): 641-646.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (EDTA, DTPA) on the Toxcity of Cadmium to Fish at Chronic Levels. Bull. Environ. Contam. Toxicol.26(5): 641-646.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (EDTA, DTPA) on the Toxcity of Cadmium to Fish at Chronic Levels. Bull. Environ. Contam. Toxicol.26(5): 641-646.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (EDTA, DTPA) on the Toxcity of Cadmium to Fish at Chronic Levels. Bull. Environ. Contam. Toxicol.26(5): 641-646.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	50	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (EDTA, DTPA) on the Toxcity of Cadmium to Fish at Chronic Levels. Bull. Environ. Contam. Toxicol.26(5): 641-646.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	50	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (EDTA, DTPA) on the Toxcity of Cadmium to Fish at Chronic Levels. Bull. Environ. Contam. Toxicol.26(5): 641-646.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	50	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (EDTA, DTPA) on the Toxcity of Cadmium to Fish at Chronic Levels. Bull. Environ. Contam. Toxicol.26(5): 641-646.
Cadmium	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	300	NA	NR	ug/L	LAB	1992. Kuroshima, R.. Effects of Acute Exposure to Cadmium on the Electrolyte Balance in Plasma of the Carp and Girella. Nippon Suisan Gakkaishi58(6): 1139-1144.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	19040		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	560	NA	NR	ug/L	LAB	1994. Iger, Y., R.A.C. Lock, J.C.A. Van der Meij, and S.E. Wendelaar Bonga. Effects of Water-Borne Cadmium on the Skin of the Common Carp (Cyprinus carpio). Arch. Environ. Contam. Toxicol.26(3): 342-350.
Cadmium	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	440	NR	NR	ug/L	LAB	1998. De conto Cinier, C., M. Petit-Ramel, R. Faure, and M. Bortolato. Cadmium Accumulation and Metallothionein Biosynthesis in Cyprinus carpio Tissues. Bull. Environ. Contam. Toxicol.61(6): 793-799.
Cadmium	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. De conto Cinier, C., M. Petit-Ramel, R. Faure, D. Garin, and Y. Bouvet. Kinetics of Cadmium Accumulation and Elimination in Carp Cyprinus carpio Tissues. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.122: 345-352.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2720		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Nitric acid, Cadmium salt	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	22	NA	NR	ug/L	LAB	1994. Iger, Y., R.A.C. Lock, J.C.A. Van der Meij, and S.E. Wendelaar Bonga. Effects of Water-Borne Cadmium on the Skin of the Common Carp (Cyprinus carpio). Arch. Environ. Contam. Toxicol.26(3): 342-350.
Cadmium chloride (CdCl2)	Common Carp	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1993. Sarkar, S.K.. Role of Cadmium Chloride on Fish and Aquatic Ecosystem. ASFA 1988-1996 CDROM, Prepared by SilverPlatter Information Inc. , Updated 1996:AN 2985087 (ABS) / Fish. Chimes12(12): 20 - 21, 23.
Cadmium chloride (CdCl2)	Common Shiner	Fish	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1986. Borgmann, U., and K.M. Ralph. Effects of Cadmium, 2,4-Dichlorophenol, and Pentachlorophenol on Feeding, Growth, and Particle-Size-Conversion Efficiency of White. Arch. Environ. Contam. Toxicol.15(5): 473-480.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	16.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	2.9	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	2.9	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	2.9	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	21.9	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	11.3	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	21.3	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	8	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	2	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	3	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	2000	NR	NR	ug/L	LAB	2008. Pistole, D.H., J.D. Peles, and K. Taylor. Influence of Metal Concentrations, Percent Salinity, and Length of Exposure on the Metabolic Rate of Fathead Minnows (Pimephales promelas). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.148(1): 48-52.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	2000	NR	NR	ug/L	LAB	2008. Pistole, D.H., J.D. Peles, and K. Taylor. Influence of Metal Concentrations, Percent Salinity, and Length of Exposure on the Metabolic Rate of Fathead Minnows (Pimephales promelas). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.148(1): 48-52.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	1.8	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	1.8	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	1.8	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	5.3	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	8	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	5.3	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	8	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR		T	37	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Carbonic acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2658000		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Carbonic acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2658000	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Cadmium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Cadmium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.1	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Cadmium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.4	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Cadmium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	25.3	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Cadmium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	27.8	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Cadmium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.8	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Cadmium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.9	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	67		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	237		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1910	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4030	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9270	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4030	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6060	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7160	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9270	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.6	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.3	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1590	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	35.4	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.9	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	230	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	67	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	138	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	237	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1987. Sherman, R.E., S.P. Gloss, and L.W. Lion. A Comparison of Toxicity Tests Conducted in the Laboratory and in Experimental Ponds Using Cadmium and the Fathead Minnow (Pimephales promelas). Water Res.21(3): 317-323.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2310	NA	NR	ug/L	LAB	1987. Sherman, R.E., S.P. Gloss, and L.W. Lion. A Comparison of Toxicity Tests Conducted in the Laboratory and in Experimental Ponds Using Cadmium and the Fathead Minnow (Pimephales promelas). Water Res.21(3): 317-323.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2780	NA	NR	ug/L	LAB	1987. Sherman, R.E., S.P. Gloss, and L.W. Lion. A Comparison of Toxicity Tests Conducted in the Laboratory and in Experimental Ponds Using Cadmium and the Fathead Minnow (Pimephales promelas). Water Res.21(3): 317-323.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1987. Sherman, R.E., S.P. Gloss, and L.W. Lion. A Comparison of Toxicity Tests Conducted in the Laboratory and in Experimental Ponds Using Cadmium and the Fathead Minnow (Pimephales promelas). Water Res.21(3): 317-323.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3420	NA	NR	ug/L	LAB	1987. Sherman, R.E., S.P. Gloss, and L.W. Lion. A Comparison of Toxicity Tests Conducted in the Laboratory and in Experimental Ponds Using Cadmium and the Fathead Minnow (Pimephales promelas). Water Res.21(3): 317-323.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3510	NA	NR	ug/L	LAB	1987. Sherman, R.E., S.P. Gloss, and L.W. Lion. A Comparison of Toxicity Tests Conducted in the Laboratory and in Experimental Ponds Using Cadmium and the Fathead Minnow (Pimephales promelas). Water Res.21(3): 317-323.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1280	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1390	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1390	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1520	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1710	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1830	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3060	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3390	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7160	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12580	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	126	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3060	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3890	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9550	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.8	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	107	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15.43	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16.99	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.4	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	67	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	73	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	79	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	84	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	84	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	35	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	35	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	48	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	49	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	125	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	76	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	84	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	87	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1986. Hall, W.S., R.L. Paulson, L.W.,Jr. Hall, and D.T. Burton. Acute Toxicity of Cadmium and Sodium Pentachlorophenate to Daphnids and Fish. Bull. Environ. Contam. Toxicol.37(2): 308-316.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1986. Hall, W.S., R.L. Paulson, L.W.,Jr. Hall, and D.T. Burton. Acute Toxicity of Cadmium and Sodium Pentachlorophenate to Daphnids and Fish. Bull. Environ. Contam. Toxicol.37(2): 308-316.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1986. Hall, W.S., R.L. Paulson, L.W.,Jr. Hall, and D.T. Burton. Acute Toxicity of Cadmium and Sodium Pentachlorophenate to Daphnids and Fish. Bull. Environ. Contam. Toxicol.37(2): 308-316.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1986. Hall, W.S., R.L. Paulson, L.W.,Jr. Hall, and D.T. Burton. Acute Toxicity of Cadmium and Sodium Pentachlorophenate to Daphnids and Fish. Bull. Environ. Contam. Toxicol.37(2): 308-316.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	72		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	272		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	298	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	72	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	18.8	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	23.9	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	243	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	27.8	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	272	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3580	NA	NR	ug/L	LAB	1988. Carrier, R., and T.L. Beitinger. Reduction in Thermal Tolerance of Notropis lutrensis and Pimephales promelas Exposed to Cadmium. Water Res.22(4): 511-515.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	144	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Nitric acid, Cadmium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Cadmium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2200	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Nitric acid, Cadmium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4600	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Nitric acid, Cadmium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13200	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Nitric acid, Cadmium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Cadmium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	65	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Cadmium salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	73	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	1090	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	670	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	78100	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	79300	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	1090	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	670	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	72600	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	79300	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	42	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	1050	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	5000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	630	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	72600	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	73500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	900	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	12000	D	6900	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	12000	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	15000	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	5600	D	2700	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	8700	D	5400	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	11000	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	12000	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	2000	D	1400	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	6400	D	4600	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	7800	D	4500	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	68	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	150	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	11000	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	12000	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	2000	D	1400	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	4500	D	2800	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	6400	D	4600	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	30000	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	32000	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	1900	D	1300	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	4500	D	2800	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	6400	D	4600	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	89	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	450	D	340	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LETC	Not Reported	T	1.2	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LETC	Not Reported	T	2	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	3	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	6	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	21.3	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	21.9	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	12.2	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	6.9	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	11.3	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	2	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	4	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	11	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	11	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	12	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	13	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	14	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	12	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	12	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	12	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	13	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	10.7	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	5.3	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	9.6	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	11.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	8.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDU	1987. Sherman, R.E., S.P. Gloss, and L.W. Lion. A Comparison of Toxicity Tests Conducted in the Laboratory and in Experimental Ponds Using Cadmium and the Fathead Minnow (Pimephales promelas). Water Res.21(3): 317-323.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	21.3	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	13.4	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	26.7	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	7400*	NA	NR	ug/L	LAB	1983. Stromberg, P.C., J.G. Ferrante, and S. Carter. Pathology of Lethal and Sublethal Exposure of Fathead Minnows, Pimephales promelas, to Cadmium: A Model for Aquatic Toxicity Assessment. J. Toxicol. Environ. Health11(2): 247-259.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	37	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	110	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	37	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	6	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.002	NR	NR	ug/L	LAB	2008. Sanchez, B.C., H. Ochoa-Acuna, D.M. Porterfield, and M.S. Sepulveda. Oxygen Flux as an Indicator of Physiological Stress in Fathead Minnow (Pimephales promelas) Embryos: A Real-Time Biomonitoring System of Water Quality. Environ. Sci. Technol.42(18): 7010-7017.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	11.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3.2	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	6.6	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2000	NR	NR	ug/L	LAB	2008. Pistole, D.H., J.D. Peles, and K. Taylor. Influence of Metal Concentrations, Percent Salinity, and Length of Exposure on the Metabolic Rate of Fathead Minnows (Pimephales promelas). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.148(1): 48-52.
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Reproduction	LOEC	Not Reported	T	2	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	T	1	NA	NR	ug/L	LAB	1997. Suedel, B.C., J.H.,Jr. Rodgers, and E. Deaver. Experimental Factors that may Affect Toxicity of Cadmium to Freshwater Organisms. Arch. Environ. Contam. Toxicol.33(2): 188-193.
Sulfuric acid, Cadmium salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	37	NA	NR	ug/L	LAB	1972. Pickering, Q.H., and M.H. Gast. Acute and Chronic Toxicity of Cadmium to the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.29(8): 1099-1106.
Cadmium	Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	5400	NA	NR	ug/L	LAB	1983. Wani, G.P., and A.N. Latey. Toxic Effects of Cadmium on the Liver of a Freshwater Teleost Garra mullya (Sykes). Curr. Sci. (Bangalore)52(21): 1034-1035.
Cadmium chloride (CdCl2)	Fish	Fish	Fresh	Reproduction	NR		T	NR	NA	NR	ug/L	LAB	1988. Das, R.C.. Cadmium Toxicity to Gonads in a Freshwater Fish, Labeo bata (Hamilton). Arch. Hydrobiol.112(3): 467-474.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	LOEC	Whole Organism	T	8.1	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	LOEC	Not Reported	T	6.5	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	MATC	Whole Organism	T	NR	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	NOEC	Whole Organism	T	4.1	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	NR	Not Reported	T	8.1	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	NR	Not Reported	T	16	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	NR	Not Reported	T	8.5	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Growth	NR	Not Reported	T	8.5	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	LOEC	Not Reported	T	0.0032	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	LOEC	Not Reported	T	8.1	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.0016	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NOEC	Not Reported	T	4.1	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	8.5	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	31	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	16.9	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	7.3	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	16.9	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	16	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	31	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	8.5	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	8.5	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	LOEC	Not Reported	T	6500	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	LOEC	Not Reported	T	7.4	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	LOEC	Not Reported	T	8.1	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	NOEC	Not Reported	T	3	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	NOEC	Not Reported	T	3.3	NR	NR	ug/L	LAB	1982. Carlson, A.R., J.A. Tucker, V.R. Mattson, G.L. Phipps, P.M. Cook, G.F. Olson, and F.A. Puglisi. Cadmium and Endrin Toxicity to Fish in Waters Containing Mineral Fibers. EPA-600/3-82-053,U.S.NTIS (PB82-225038), Springfield, VA: 31 p..
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	NOEC	Not Reported	T	4.1	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Flagfish	Fish	Fresh	Reproduction	NR	Not Reported	T	8.5	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Growth	LOEC	Whole Organism	T	11.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Growth	LOEC	Whole Organism	T	5.3	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Growth	LOEC	Whole Organism	T	5.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Growth	LOEC	Whole Organism	T	8.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Growth	LOEC	Whole Organism	T	9.6	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Growth	NOEC	Whole Organism	T	2.8	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Growth	NOEC	Whole Organism	T	4.1	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Growth	NOEC	Whole Organism	T	5.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Growth	NOEC	Whole Organism	T	5.7	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Growth	NOEC	Whole Organism	T	6.6	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	11.77	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	13.27	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	14.23	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	15.7	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	7.38	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	7.68	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	8.23	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	8.48	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	5.45	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LOEC	Not Reported	T	11.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LOEC	Not Reported	T	8.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LOEC	Not Reported	T	5.3	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LOEC	Not Reported	T	9.6	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	LOEC	Not Reported	T	1.4	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NOEC	Not Reported	T	6.6	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NOEC	Not Reported	T	4.1	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NOEC	Not Reported	T	5.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NOEC	Not Reported	T	5.7	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	16.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	17.9	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	21.3	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	21.9	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5.5	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Cadmium chloride (CdCl2)	Fountain Darter	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5.7	NR	NR	ug/L	LAB	2000. Southwest Texas State University. Comparison of EPA Target Toxicity Aquatic Test Organisms to the Fountain Darter. 7 Day Chronic Toxicity Test Using Cadmium Chloride. Performed 11/12/99 - 3/6/00 (5 parts). Edwards Aquifer Res.and Data Center (EARDC), Southwest Texas State Univ., San Marcos, TX.Fed.Assist.Agree.No.X-986345-01: 179 p..
Sulfuric acid, Cadmium salt (1:1)	Giant Gourami	Fish	NR	Mortality	LC50	Not Reported	T	67900*	NA	NR	ug/L	LAB	1979. Srivastava, A.K., and S. Mishra. Blood Dyscrasia in a Teleost Fish, Colisa fasciatus, Associated with Cadmium Poisoning. J. Comp. Pathol.89(4): 609-613.
Cadmium	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	3150	NA	NR	ug/L	LAB	1987. Benson, W.H., K.N. Baer, R.A. Stackhouse, and C.F. Watson. Influence of Cadmium Exposure on Selected Hematological Parameters in Freshwater Teleost, Notemigonus crysoleucas. Ecotoxicol. Environ. Saf.13(1): 92-96.
Cadmium chloride (CdCl2)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1989. Hartwell, S.I., J.H. Jin, D.S. Cherry, and J.,Jr. Cairns. Toxicity Versus Avoidance Response of Golden Shiner, Notemigonus crysoleucas, to Five Metals. J. Fish Biol.35(3): 447-456.
Nitric acid, Cadmium salt	Goldfish	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Moza, U., S.S. DeSilva, and B.M. Mitchell. Effect of Sub-lethal Concentrations of Cadmium on Food Intake, Growth and Digestibility in the Gold Fish, Carassius auratus L. J. Environ. Biol.16(3): 253-264.
Cadmium	Goldfish	Fish	NR	Growth	NR	Not Reported	T	0.27	NA	NR	ug/L	LAB	1984. Westerman, A.G.. The Chronic Effects of Low-Level Mercury and Cadmium to Goldfish (Carassius auratus). Diss. Abstr. Int. B Sci. Eng. 45:1096 / Ph. D. Thesis, University of Kentucky, Lexington, KY: 263 p..
Cadmium	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1780	NA	NR	ug/L	LAB	1978. McCarty, L.S., J.A.C. Henry, and A.H. Houston. Toxicity of Cadmium to Goldfish Carassius auratus in Hard and Soft Water. J. Fish. Res. Board Can.35(1): 35-42.
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	40200	NA	NR	ug/L	LAB	1978. McCarty, L.S., J.A.C. Henry, and A.H. Houston. Toxicity of Cadmium to Goldfish Carassius auratus in Hard and Soft Water. J. Fish. Res. Board Can.35(1): 35-42.
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1978. Kariya, T., H. Haga, Y. Haga, and Y. Kawasaki. Studies on the Post-Mortem Identification of the Pollutant in Fish Killed by Water Pollution - XIII. Cadmium. Nippon Suisan Gakkaishi44(10): 1065-1072.
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2760	NA	NR	ug/L	LAB	1978. McCarty, L.S., J.A.C. Henry, and A.H. Houston. Toxicity of Cadmium to Goldfish Carassius auratus in Hard and Soft Water. J. Fish. Res. Board Can.35(1): 35-42.
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	46900	NA	NR	ug/L	LAB	1978. McCarty, L.S., J.A.C. Henry, and A.H. Houston. Toxicity of Cadmium to Goldfish Carassius auratus in Hard and Soft Water. J. Fish. Res. Board Can.35(1): 35-42.
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	748	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	D	12600	NA	NR	ug/L	LAB	1980. Busacker, G.P.. Osmoregulatory Effects of Acute Cadmium Toxicity in a Model Teleost. Ph.D.Thesis, Wayne State Univ., Detroit, MI: 225 p..
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2130	NA	NR	ug/L	LAB	1978. McCarty, L.S., J.A.C. Henry, and A.H. Houston. Toxicity of Cadmium to Goldfish Carassius auratus in Hard and Soft Water. J. Fish. Res. Board Can.35(1): 35-42.
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	46800	NA	NR	ug/L	LAB	1978. McCarty, L.S., J.A.C. Henry, and A.H. Houston. Toxicity of Cadmium to Goldfish Carassius auratus in Hard and Soft Water. J. Fish. Res. Board Can.35(1): 35-42.
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1978. Fennikoh, K.B., H.I. Hirshfield, and T.J. Kneip. Cadmium Toxicity in Planktonic Organisms of a Freshwater Food Web. Environ. Res.15(3): 357-367.
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	D	12600	NA	NR	ug/L	LAB	1980. Busacker, G.P.. Osmoregulatory Effects of Acute Cadmium Toxicity in a Model Teleost. Ph.D.Thesis, Wayne State Univ., Detroit, MI: 225 p..
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	48.9	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium	Goldfish	Fish	NR	Mortality	LC50	Not Reported	T	48.9	NA	NR	ug/L	LAB	1984. Westerman, A.G.. The Chronic Effects of Low-Level Mercury and Cadmium to Goldfish (Carassius auratus). Diss. Abstr. Int. B Sci. Eng. 45:1096 / Ph. D. Thesis, University of Kentucky, Lexington, KY: 263 p..
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. Francis, P.C., W.J. Birge, and J.A. Black. Effects of Cadmium-Enriched Sediment on Fish and Amphibian Embryo-Larval Stages. Ecotoxicol. Environ. Saf.8(4): 378-387.
Nitric acid, Cadmium salt	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Moza, U., S.S. DeSilva, and B.M. Mitchell. Effect of Sub-lethal Concentrations of Cadmium on Food Intake, Growth and Digestibility in the Gold Fish, Carassius auratus L. J. Environ. Biol.16(3): 253-264.
Cadmium chloride (CdCl2)	Goldfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	87.6	NA	NR	uM	LAB	1996. Gargiulo, G., P. De Girolamo, L. Ferrara, O. Soppelsa, G. Andreozzi, R. Antonucci, and P. Battaglini. Action of Cadmium on the Gills of Carassius auratus L. in the Presence of Catabolic NH3. Arch. Environ. Contam. Toxicol.30(2): 235-240.
Cadmium	Goldfish	Fish	NR	Reproduction	NR	Not Reported	T	0.27	NA	NR	ug/L	LAB	1984. Westerman, A.G.. The Chronic Effects of Low-Level Mercury and Cadmium to Goldfish (Carassius auratus). Diss. Abstr. Int. B Sci. Eng. 45:1096 / Ph. D. Thesis, University of Kentucky, Lexington, KY: 263 p..
Cadmium	Grass Carp, White Amur	Fish	Fresh	Growth	NR	Not Reported	T	1.5	NA	NR	ug/L	LAB	1990. Mao, S., and C. Wang. The Effect of Some Pollutants on SCE of Grass Carp (Ctenopharyngodon idellus) Cells. Oceanol. Limnol. Sin. /Haiyang Yu Huzhao21(3): 205-211.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	EC50	Not Reported	T	78	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	1180	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	7200	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	580	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	580	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Cadmium chloride (CdCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Nitric acid, Cadmium salt	Grass Carp, White Amur	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Espina, S., A. Salibian, and F. Diaz. Influence of Cadmium on the Respiratory Function of the Grass Carp Ctenopharyngodon idella. Water Air Soil Pollut.119(1-4): 1-10.
Sulfuric acid, Cadmium salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2500	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.
Sulfuric acid, Cadmium salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.
Nitric acid, Cadmium salt	Grass Carp, White Amur	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NR	NR	ug/L	LAB	2000. Espina, S., A. Salibian, and F. Diaz. Influence of Cadmium on the Respiratory Function of the Grass Carp Ctenopharyngodon idella. Water Air Soil Pollut.119(1-4): 1-10.
Nitric acid, Cadmium salt	Grass Carp, White Amur	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NR	NR	ug/L	LAB	2000. Espina, S., A. Salibian, and F. Diaz. Influence of Cadmium on the Respiratory Function of the Grass Carp Ctenopharyngodon idella. Water Air Soil Pollut.119(1-4): 1-10.
Cadmium chloride (CdCl2)	Green Sunfish	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Jude, D.J.. Sublethal Effects of Ammonia and Cadmium on Growth of Green Sunfish, (Lepomis cyanellus). Ph.D.Thesis, Mich.Dep.Fish Wildl., Michigan State Univ., East Lansing, MI: 193 p..
Cadmium chloride (CdCl2)	Green Sunfish	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Jude, D.J.. Sublethal Effects of Ammonia and Cadmium on Growth of Green Sunfish, (Lepomis cyanellus). Ph.D.Thesis, Mich.Dep.Fish Wildl., Michigan State Univ., East Lansing, MI: 193 p..
Cadmium chloride (CdCl2)	Green Sunfish	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Jude, D.J.. Sublethal Effects of Ammonia and Cadmium on Growth of Green Sunfish, (Lepomis cyanellus). Ph.D.Thesis, Mich.Dep.Fish Wildl., Michigan State Univ., East Lansing, MI: 193 p..
Sulfuric acid, Cadmium salt (1:1)	Green Sunfish	Fish	Fresh	Mortality	LC50	Not Reported	T	11520	NA	NR	ug/L	LAB	1988. Carrier, R., and T.L. Beitinger. Resistance of Temperature Tolerance Ability of Green Sunfish to Cadmium Exposure. Bull. Environ. Contam. Toxicol.40(4): 475-480.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Green Sunfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	7840	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Green Sunfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	88600	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Green Sunfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	3680	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Green Sunfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	71300	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Green Sunfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	2840	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Green Sunfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	66000	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Miliou, H., N. Zaboukas, and M. Moraitou-Apostolopoulou. Biochemical Composition, Growth, and Survival of the Guppy, Poecilia reticulata, During Chronic Sublethal Exposure to Cadmium. Arch. Environ. Contam. Toxicol.35(1): 58-63.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Growth	NR		T	20	NA	NR	ug/L	LAB	1987. Hatakeyama, S., and M. Yasuno. Chronic Effects of Cd on the Reproduction of the Guppy (Poecilia reticulata) Through Cd-Accumulated Midge Larvae (Chironomus yoshimatsui). Ecotoxicol. Environ. Saf.14: 191-201.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Growth	NR		T	274000	NA	NR	ug/L	LAB	1987. Hatakeyama, S., and M. Yasuno. Chronic Effects of Cd on the Reproduction of the Guppy (Poecilia reticulata) Through Cd-Accumulated Midge Larvae (Chironomus yoshimatsui). Ecotoxicol. Environ. Saf.14: 191-201.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Growth	NR		T	10	NA	NR	ug/L	LAB	1982. Hatakeyama, S., and M. Yasuno. Accumulation and Effects of Cadmium on Guppy (Poecilia reticulata) fed Cadmium-Dosed Cladocera (Moina macrocopa). Bull. Environ. Contam. Toxicol.29(2): 159-166.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Growth	NR		T	5	NA	NR	ug/L	LAB	1982. Hatakeyama, S., and M. Yasuno. Accumulation and Effects of Cadmium on Guppy (Poecilia reticulata) fed Cadmium-Dosed Cladocera (Moina macrocopa). Bull. Environ. Contam. Toxicol.29(2): 159-166.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC01	Not Reported	T	22800	NR	NR	ug/L	LAB	2004. Yilmaz, M., A. Gul, and E. Karakose. Investigation of Acute Toxicity and the Effect of Cadmium Chloride (CdCl2.H2O) Metal Salt on Behavior of the Guppy (Poecilia reticulata). Chemosphere56(4): 375-380.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC10	Not Reported	T	25900	NR	NR	ug/L	LAB	2004. Yilmaz, M., A. Gul, and E. Karakose. Investigation of Acute Toxicity and the Effect of Cadmium Chloride (CdCl2.H2O) Metal Salt on Behavior of the Guppy (Poecilia reticulata). Chemosphere56(4): 375-380.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC15	Not Reported	T	26800	NR	NR	ug/L	LAB	2004. Yilmaz, M., A. Gul, and E. Karakose. Investigation of Acute Toxicity and the Effect of Cadmium Chloride (CdCl2.H2O) Metal Salt on Behavior of the Guppy (Poecilia reticulata). Chemosphere56(4): 375-380.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC5	Not Reported	T	24800	NR	NR	ug/L	LAB	2004. Yilmaz, M., A. Gul, and E. Karakose. Investigation of Acute Toxicity and the Effect of Cadmium Chloride (CdCl2.H2O) Metal Salt on Behavior of the Guppy (Poecilia reticulata). Chemosphere56(4): 375-380.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	10400	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	33000	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	20500	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	5700	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	56768	NR	NR	ug/L	LAB	1998. Miliou, H., N. Zaboukas, and M. Moraitou-Apostolopoulou. Biochemical Composition, Growth, and Survival of the Guppy, Poecilia reticulata, During Chronic Sublethal Exposure to Cadmium. Arch. Environ. Contam. Toxicol.35(1): 58-63.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	14400	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	11100	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	30400	NR	NR	ug/L	LAB	2004. Yilmaz, M., A. Gul, and E. Karakose. Investigation of Acute Toxicity and the Effect of Cadmium Chloride (CdCl2.H2O) Metal Salt on Behavior of the Guppy (Poecilia reticulata). Chemosphere56(4): 375-380.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	12750	NR	NR	ug/L	LAB	1983. Gadkari, A.S., and V.B. Marathe. Toxicity of Cadmium and Lead to a Fish and a Snail from Two Different Habitats. Indian Assoc. Water Pollut. Control Tech. Annu.5: 141-148.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NR	NR	ug/L	LAB	1983. Gadkari, A.S., and V.B. Marathe. Toxicity of Cadmium and Lead to a Fish and a Snail from Two Different Habitats. Indian Assoc. Water Pollut. Control Tech. Annu.5: 141-148.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NR	NR	ug/L	LAB	1983. Gadkari, A.S., and V.B. Marathe. Toxicity of Cadmium and Lead to a Fish and a Snail from Two Different Habitats. Indian Assoc. Water Pollut. Control Tech. Annu.5: 141-148.
Nitric acid, Cadmium salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	115000	NR	NR	ug/L	LAB	1979. Kuhn, R., and J.H. Canton. Comparative Hydrobiological-Toxicological Results in Micro- and Macroorganisms of Biological Spectra (Vergleichende Hydrobiologisch-Toxikologische Befunde an Mikro- und Makroorganismen Biologischer Spektren). In: K.Aurand and J.Spaander (Eds.), Reinhaltung des Wassers, Verlag, Berlin, GER: 58-68.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	3370	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	2310	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	1270	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC85	Not Reported	T	34600	NR	NR	ug/L	LAB	2004. Yilmaz, M., A. Gul, and E. Karakose. Investigation of Acute Toxicity and the Effect of Cadmium Chloride (CdCl2.H2O) Metal Salt on Behavior of the Guppy (Poecilia reticulata). Chemosphere56(4): 375-380.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC90	Not Reported	T	35700	NR	NR	ug/L	LAB	2004. Yilmaz, M., A. Gul, and E. Karakose. Investigation of Acute Toxicity and the Effect of Cadmium Chloride (CdCl2.H2O) Metal Salt on Behavior of the Guppy (Poecilia reticulata). Chemosphere56(4): 375-380.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC95	Not Reported	T	37300	NR	NR	ug/L	LAB	2004. Yilmaz, M., A. Gul, and E. Karakose. Investigation of Acute Toxicity and the Effect of Cadmium Chloride (CdCl2.H2O) Metal Salt on Behavior of the Guppy (Poecilia reticulata). Chemosphere56(4): 375-380.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	LC99	Not Reported	T	40600	NR	NR	ug/L	LAB	2004. Yilmaz, M., A. Gul, and E. Karakose. Investigation of Acute Toxicity and the Effect of Cadmium Chloride (CdCl2.H2O) Metal Salt on Behavior of the Guppy (Poecilia reticulata). Chemosphere56(4): 375-380.
Cadmium	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1993. Sharma, A., and M.S. Sharma. Vertebral Defects in Lebistes reticulatus (Peters) and Cyprinus carpio (Linnaeus) Exposed to Heavy Metals. Pollut. Res.12(3): 139-143.
Cadmium	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Jones, W.E.. Detection of Pollutants by Fish Tests. Water Treat. Exam.24: 132-139.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	36000	NR	NR	ug/L	LAB	2004. Yilmaz, M., A. Gul, and E. Karakose. Investigation of Acute Toxicity and the Effect of Cadmium Chloride (CdCl2.H2O) Metal Salt on Behavior of the Guppy (Poecilia reticulata). Chemosphere56(4): 375-380.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	22500	NR	NR	ug/L	LAB	2004. Yilmaz, M., A. Gul, and E. Karakose. Investigation of Acute Toxicity and the Effect of Cadmium Chloride (CdCl2.H2O) Metal Salt on Behavior of the Guppy (Poecilia reticulata). Chemosphere56(4): 375-380.
Cadmium chloride (CdCl2)	Guppy	Fish	Fresh	Reproduction	NR		T	210000	NA	NR	ug/L	LAB	1987. Hatakeyama, S., and M. Yasuno. Chronic Effects of Cd on the Reproduction of the Guppy (Poecilia reticulata) Through Cd-Accumulated Midge Larvae (Chironomus yoshimatsui). Ecotoxicol. Environ. Saf.14: 191-201.
Cadmium	Guppy	Fish	NR	Reproduction	NR		T	NR	NA	NR	ug/L	LAB	1984. Hatakeyama, S.. Accumulation and Chronic Effects of Cadmium on the Guppy (Poecilia reticulata) Fed the Cadmium-Accumulated Midge Larvae (Chironomus yoshimatsui). C. A. Sel. - Environ. Pollut.22: 2.
Cadmium	Guppy	Fish	NR	Reproduction	NR		T	210000	NA	NR	ug/L	LAB	1984. Hatakeyama, S.. Accumulation and Chronic Effects of Cadmium on the Guppy (Poecilia reticulata) Fed the Cadmium-Accumulated Midge Larvae (Chironomus yoshimatsui). C. A. Sel. - Environ. Pollut.22: 2.
Cadmium chloride (CdCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	39800	NA	NR	ug/L	LAB	1993. Saxena, K.K., A.K. Dubey, and R.R.S. Chauhan. Experimental Studies on Toxicity of Zinc and Cadmium to Heteropneustes fossilis (Bl.). J. Freshw. Biol.5(4): 343-346.
Cadmium chloride (CdCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	30500	NA	NR	ug/L	LAB	1993. Saxena, K.K., A.K. Dubey, and R.R.S. Chauhan. Experimental Studies on Toxicity of Zinc and Cadmium to Heteropneustes fossilis (Bl.). J. Freshw. Biol.5(4): 343-346.
Cadmium chloride (CdCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	24800	NA	NR	ug/L	LAB	1993. Saxena, K.K., A.K. Dubey, and R.R.S. Chauhan. Experimental Studies on Toxicity of Zinc and Cadmium to Heteropneustes fossilis (Bl.). J. Freshw. Biol.5(4): 343-346.
Cadmium chloride (CdCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	383450	NR	NR	ug/L	LAB	1994. Das, B.K., and A. Kaviraj. Individual and Interactive Lethal Toxicity of Cadmium, Potassium Permanganate and Cobalt Chloride to Fish, Worm and Plankton. Geobios21(4): 223-227.
Cadmium chloride (CdCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	19700	NA	NR	ug/L	LAB	1993. Saxena, K.K., A.K. Dubey, and R.R.S. Chauhan. Experimental Studies on Toxicity of Zinc and Cadmium to Heteropneustes fossilis (Bl.). J. Freshw. Biol.5(4): 343-346.
Cadmium chloride (CdCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	300000	NA	NR	ug/L	LAB	1980. Das, K.K., and S.K. Banerjee. Cadmium Toxicity in Fishes. Hydrobiologia75(2): 117-122.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	114800	NA	NR	ug/L	LAB	1993. Ghosh, A.R., and P. Chakrabarti. Histopathological and Histochemical Changes in Liver, Pancreas and Kidney of the Freshwater Fish Heteropneustes fossilis (Bloch) Exposed to Cadmium. Environ. Ecol.11(1): 185-188.
Cadmium chloride (CdCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	114800	NA	NR	ug/L	LAB	1990. Chakrabarti, P., and A.R. Ghosh. Effects of Cadmium Poisoning on Mucopolysaccharides and Some Cellular Enzymes of the Alimentary Canal in Heteropneustes fossilis (Bloch): A. In: G.K.Manna and B.B.Jana (Eds.), Impacts of Environment on Animals and Aquaculture, Univ.of Kalyani, Kalyani, India: 215-222.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	20600	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	21900	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	30500	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	48800	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	70800	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	17900	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	D	14600	NA	NR	ug/L	LAB	1982. Gupta, A.K., and V.K. Rajbanshi. Cytopathological Studies Resulting in Cadmium Bioassay with Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.10(4): 345-351.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	14600	NA	NR	ug/L	LAB	1988. Gupta, A.K.. Accumulation of Cadmium in the Fishes Heteropneustes fossilis and Channa punctatus. Environ. Ecol.6(3): 577-580.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	14600	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LETC	Not Reported	T	11000	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LETC	Not Reported	T	12800	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	MATC	Not Reported	T	8400	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid, Cadmium salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	MATC	Not Reported	T	9000	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Cadmium chloride (CdCl2)	Indian Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	31000*	NA	NR	ug/L	LAB	1979. Chauhan, T.P.S., M.M. Prakash, K.C. Gupta, and B.R. Varma. Observations on the Toxicity of Cadmium Chloride to Heteropneustes fossilis (Bloch). Comp. Physiol. Ecol.4(2): 59-60.
Cadmium chloride (CdCl2)	Indian Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	49000*	NA	NR	ug/L	LAB	1979. Chauhan, T.P.S., M.M. Prakash, K.C. Gupta, and B.R. Varma. Observations on the Toxicity of Cadmium Chloride to Heteropneustes fossilis (Bloch). Comp. Physiol. Ecol.4(2): 59-60.
Cadmium chloride (CdCl2)	Indian Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	150000*	NA	NR	ug/L	LAB	1979. Chauhan, T.P.S., M.M. Prakash, K.C. Gupta, and B.R. Varma. Observations on the Toxicity of Cadmium Chloride to Heteropneustes fossilis (Bloch). Comp. Physiol. Ecol.4(2): 59-60.
Cadmium chloride (CdCl2)	Indian Freshwater Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	1350	NA	NR	ug/L	LAB	1989. Gaikwad, S.A.. Effects of Mixture and Three Individual Heavy Metals on Susceptibility of Three Fresh Water Fishes. Pollut. Res.8(1): 33-35.
Cadmium	Japanese Barbel	Fish	Fresh	Growth	NR	Not Reported	T	2	NR	NR	ug/L	NR	1973. Kumada, H., S. Kimura, M. Yokote, and Y. Matida. Acute and Chronic Toxicity, Uptake and Retention of Cadmium in Freshwater Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)22(2): 157-165.
Cadmium	Japanese Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Kumada, H., S. Kimura, M. Yokote, and Y. Matida. Acute and Chronic Toxicity, Uptake and Retention of Cadmium in Freshwater Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)22(2): 157-165.
Cadmium	Japanese Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Kumada, H., S. Kimura, M. Yokote, and Y. Matida. Acute and Chronic Toxicity, Uptake and Retention of Cadmium in Freshwater Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)22(2): 157-165.
Cadmium chloride (CdCl2)	Japanese Eel	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.
Cadmium chloride (CdCl2)	Japanese Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	1680	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.
Cadmium chloride (CdCl2)	Japanese Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	2320	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Japanese Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	3770	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.
Cadmium	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	730	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Cadmium	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Cadmium	Lake Trout, Siscowet	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Kislalioglu, M., E. Scherer, and R.E. NcNicol. Effects of Cadmium on Foraging Behaviour of Lake Charr, Salvelinus namaycush. Environ. Biol. Fishes46(1): 75-82.
Cadmium chloride (CdCl2)	Lambari	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1996. Randi, A.S., J.M. Monserrat, E.M. Rodriguez, and L.A. Romano. Histopathological Effects of Cadmium on the Gills of the Freshwater Fish, Macropsobrycon uruguayanae Eigenmann (Pisces, Atherinidae). J. Fish Dis.19(4): 311-322.
Cadmium chloride (CdCl2)	Lambari	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Randi, A.S., J.M. Monserrat, E.M. Rodriguez, and L.A. Romano. Histopathological Effects of Cadmium on the Gills of the Freshwater Fish, Macropsobrycon uruguayanae Eigenmann (Pisces, Atherinidae). J. Fish Dis.19(4): 311-322.
Cadmium chloride (CdCl2)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	244.1	NA	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, and A.G. Westerman. Short-Term Fish and Amphibian Embryo-Larval Tests for Determining the Effects of Toxicant Stress on Early Life Stages and Estimating Chronic Values. Environ. Toxicol. Chem.4(6): 807-821.
Cadmium chloride (CdCl2)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	1040	NA	NR	ug/L	LAB	1980. Black, J.A., and W.J. Birge. An Avoidance Response Bioassay for Aquatic Pollutants. Res.Report No.123, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 34-180490.
Cadmium chloride (CdCl2)	Largemouth Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	1640	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Cadmium chloride (CdCl2)	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	4800	NA	NR	ug/L	LAB	1974. Morgan, W.S.G., and P.C. Kuhn. A Method to Monitor the Effects of Toxicants upon Breathing Rate of Largemouth Bass (Micropterus salmoides Lacepede). Water Res.8(1): 67-77.
Cadmium chloride (CdCl2)	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	1230	NA	NR	ug/L	LAB	1974. Morgan, W.S.G., and P.C. Kuhn. A Method to Monitor the Effects of Toxicants upon Breathing Rate of Largemouth Bass (Micropterus salmoides Lacepede). Water Res.8(1): 67-77.
Cadmium chloride (CdCl2)	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	70	NA	NR	ug/L	LAB	1974. Morgan, W.S.G., and P.C. Kuhn. A Method to Monitor the Effects of Toxicants upon Breathing Rate of Largemouth Bass (Micropterus salmoides Lacepede). Water Res.8(1): 67-77.
Cadmium chloride (CdCl2)	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	43.9	NA	NR	ug/L	LAB	1984. Francis, P.C., W.J. Birge, and J.A. Black. Effects of Cadmium-Enriched Sediment on Fish and Amphibian Embryo-Larval Stages. Ecotoxicol. Environ. Saf.8(4): 378-387.
Cadmium chloride (CdCl2)	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. Francis, P.C., W.J. Birge, and J.A. Black. Effects of Cadmium-Enriched Sediment on Fish and Amphibian Embryo-Larval Stages. Ecotoxicol. Environ. Saf.8(4): 378-387.
Cadmium chloride (CdCl2)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	1600*	NA	NR	ug/L	LAB	1986. Victor, B., S. Mahalingam, and R. Sarojini. Toxicity of Mercury and Cadmium on Oocyte Differentiation and Vitellogenesis of the Teleost, Lepidocephalichtyhs thermalis (Bleeker). J. Environ. Biol.7(4): 209-214.
Cadmium chloride (CdCl2)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	1300*	NA	NR	ug/L	LAB	1986. Victor, B., S. Mahalingam, and R. Sarojini. Toxicity of Mercury and Cadmium on Oocyte Differentiation and Vitellogenesis of the Teleost, Lepidocephalichtyhs thermalis (Bleeker). J. Environ. Biol.7(4): 209-214.
Cadmium chloride (CdCl2)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	1100*	NA	NR	ug/L	LAB	1986. Victor, B., S. Mahalingam, and R. Sarojini. Toxicity of Mercury and Cadmium on Oocyte Differentiation and Vitellogenesis of the Teleost, Lepidocephalichtyhs thermalis (Bleeker). J. Environ. Biol.7(4): 209-214.
Cadmium chloride (CdCl2)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	800*	NA	NR	ug/L	LAB	1986. Victor, B., S. Mahalingam, and R. Sarojini. Toxicity of Mercury and Cadmium on Oocyte Differentiation and Vitellogenesis of the Teleost, Lepidocephalichtyhs thermalis (Bleeker). J. Environ. Biol.7(4): 209-214.
Cadmium	Long-Nosed Siberian Sturgeon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Cadmium	Long-Nosed Siberian Sturgeon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Cadmium	Medaka, High-Eyes	Fish	Fresh	Growth	NR		T	10	NA	NR	ug/L	LAB	1984. Hiraoka, Y., and H. Okuda. Time Course Study of Occurrence of Anomalies in Medaka's Centrum by Cadmium or Fenitrothion Emulsion. Bull. Environ. Contam. Toxicol.32(6): 693-697.
Cadmium	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	16	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	135000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	15000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	68000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	40000	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	50000	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	30000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Nitric acid, Cadmium salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	154000	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Cadmium	Medaka, High-Eyes	Fish	NR	Mortality	LC50	Not Reported	T	4003	NA	NR	ug/L	LAB	1980. Kasuga, S.. Sexual Differences of Medaka, Oryzias latipes in the Acute Toxicity Test of Cadmium. Nippon Suisan Gakkaishi46(9): 1073-1076.
Cadmium	Medaka, High-Eyes	Fish	NR	Mortality	LC50	Not Reported	T	4696	NA	NR	ug/L	LAB	1980. Kasuga, S.. Sexual Differences of Medaka, Oryzias latipes in the Acute Toxicity Test of Cadmium. Nippon Suisan Gakkaishi46(9): 1073-1076.
Cadmium	Medaka, High-Eyes	Fish	NR	Mortality	LC50	Not Reported	T	4884	NA	NR	ug/L	LAB	1980. Kasuga, S.. Sexual Differences of Medaka, Oryzias latipes in the Acute Toxicity Test of Cadmium. Nippon Suisan Gakkaishi46(9): 1073-1076.
Cadmium	Medaka, High-Eyes	Fish	NR	Mortality	LC50	Not Reported	T	5773	NA	NR	ug/L	LAB	1980. Kasuga, S.. Sexual Differences of Medaka, Oryzias latipes in the Acute Toxicity Test of Cadmium. Nippon Suisan Gakkaishi46(9): 1073-1076.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50*	Not Reported	T	300	NA	NR	ug/L	LAB	1981. Michibata, H.. Effect of Water Hardness on the Toxicity of Cadmium to the Egg of the Teleost Oryzias latipes. Bull. Environ. Contam. Toxicol.27(2): 187-192.
Cadmium	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Nakagawa, H., and S. Ishio. Effects of Water Hardness on the Toxicity and Accumulation of Cadmium in Eggs and Larvae of Medaka Oryzias latipes. Nippon Suisan Gakkaishi55(2): 321-326.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1985. Hiraoka, Y.. A Re-Examination of the Toxicity Test for Water Pollutants. Hiroshima J. Med. Sci.34(3): 323-326.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	6000*	NA	NR	ug/L	LAB	1986. Michibata, H., S. Sahara, and M.K. Kojima. Effects of Calcium and Magnesium Ions on the Toxicity of Cadmium to the Egg ofthe Teleost, Oryzias latipes. Environ. Res.40(1): 110-114.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Hiraoka, Y., S. Ishizawa, T. Kamada, and H. Okuda. Acute Toxicity of 14 Different Kinds of Metals Affecting Medaka Fry. Hiroshima J. Med. Sci.34(3): 327-330.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Cadmium chloride (CdCl2)	Medaka, High-Eyes	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2002. Foran, C.M., B.N. Peterson, and W.H. Benson. Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese Medaka (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(3): 345-354.
Nitric acid, Cadmium salt	Minnow	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	T	2.7	NA	NR	nmol/L	LAB	1992. Glynn, A.W., C. Haux, and C. Hogstrand. Chronic Toxicity and Metabolism of Cd and Zn in Juvenile Minnows (Phoxinus phoxinus) Exposed to a Cd and Zn Mixture. Can. J. Aquat. Sci.49(10): 2070-2079.
Cadmium chloride (CdCl2)	Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	554.6	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Cadmium chloride (CdCl2)	Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	370.5	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Cadmium chloride (CdCl2)	Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	291.8	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Sulfuric acid, Cadmium salt (1:1)	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	N	LAB	1927. Carpenter, K.E.. The Lethal Action of Soluble Metallic Salts on Fishes. Br. J. Exp. Biol.4: 378-391.
Nitric acid, Cadmium salt	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	2.7	NA	NR	nmol/L	LAB	1992. Glynn, A.W., C. Haux, and C. Hogstrand. Chronic Toxicity and Metabolism of Cd and Zn in Juvenile Minnows (Phoxinus phoxinus) Exposed to a Cd and Zn Mixture. Can. J. Aquat. Sci.49(10): 2070-2079.
Cadmium chloride (CdCl2)	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Cadmium chloride (CdCl2)	Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1700	NR	NR	ug/L	LAB	1999. Sanchez-Galan, S., A.R. Linde, and E. Garcia-Vazquez. Brown Trout and European Minnow as Target Species for Genotoxicity Tests: Differential Sensitivity to Heavy Metals. Ecotoxicol. Environ. Saf.43(3): 301-304.
Cadmium chloride (CdCl2)	Minnow,Carp Family	Fish	Fresh	Mortality	LC50*	Not Reported	T	5000	NA	NR	ug/L	LAB	1985. Nishihara, T., T. Shimamoto, K.C. Wen, and M. Kondo. Accumulation of Lead, Cadmium and Chromium in Several Organs and Tissues of Carp. J. Hyg. Chem. /Eisei Kagaku31(2): 119-123.
Cadmium chloride (CdCl2)	Minnow,Carp Family	Fish	Fresh	Mortality	LC50*	Not Reported	T	3100	NA	NR	ug/L	LAB	1985. Nishihara, T., T. Shimamoto, K.C. Wen, and M. Kondo. Accumulation of Lead, Cadmium and Chromium in Several Organs and Tissues of Carp. J. Hyg. Chem. /Eisei Kagaku31(2): 119-123.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Minnow,Carp Family	Fish	Fresh	Mortality	LC50*	Not Reported	T	3000	NA	NR	ug/L	LAB	1985. Nishihara, T., T. Shimamoto, K.C. Wen, and M. Kondo. Accumulation of Lead, Cadmium and Chromium in Several Organs and Tissues of Carp. J. Hyg. Chem. /Eisei Kagaku31(2): 119-123.
Cadmium	Minnow,Carp Family	Fish	Fresh	Mortality	NR	Not Reported	T	13000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	30000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	25000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	25000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	15000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	20000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Growth	EC50	Not Reported	T	1.77		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Growth	EC50	Not Reported	T	2.4		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Growth	LOEC	Not Reported	T	1.3		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Growth	LOEC	Not Reported	T	5.3		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Growth	MATC	Not Reported	T	0.88		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Growth	MATC	Not Reported	T	3.7		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Growth	NOEC	Not Reported	T	0.59		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Growth	NOEC	Not Reported	T	2.6		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Growth	NOEL	Not Reported	T	2.7		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Growth	NOEL	Not Reported	T	2.6		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	2.02		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	1.73		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	2.9		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	17		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	2.9		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	23		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	3.6		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	7.9		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	5.6		NR	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	LOEC	Not Reported	T	1.3		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	LOEC	Not Reported	T	2.6		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	MATC	Not Reported	T	1.9		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	MATC	Not Reported	T	0.88		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	MATC	Not Reported	T	1.9		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.59		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.4		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5.2		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5.3		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	11		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3.8		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	41		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	41		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.4		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.3		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	11		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	11		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2.2		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2.7		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	67		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	LOEC	Whole Organism	D	4.32	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	LOEC	Whole Organism	D	1.71	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	MATC	Whole Organism	D	3.23	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	MATC	Whole Organism	D	1.25	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	NOEC	Whole Organism	D	2.41	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	NOEC	Whole Organism	D	0.92	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LC50	Not Reported	D	4.7	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LOEC	Not Reported	D	3.4	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LOEC	Not Reported	D	4.32	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	MATC	Not Reported	D	3.23	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	MATC	Not Reported	D	2.41	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NOEC	Not Reported	D	13.5	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NOEC	Not Reported	D	1.71	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NOEC	Not Reported	D	2.41	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	6.74	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	6.69	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Cadmium salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	2.41	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Growth	LOEC	Whole Organism	T	40	NR	NR	ug/L	LAB	2007. Wu, S.M., Y.C. Ho, and M.J. Shih. Effects of Ca2+ or Na+ on Metallothionein Expression in Tilapia Larvae (Oreochromis mossambicus) Exposed to Cadmium or Copper. Arch. Environ. Contam. Toxicol.52(2): 229-234.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Growth	LOEC	Whole Organism	T	40	NR	NR	ug/L	LAB	2007. Wu, S.M., Y.C. Ho, and M.J. Shih. Effects of Ca2+ or Na+ on Metallothionein Expression in Tilapia Larvae (Oreochromis mossambicus) Exposed to Cadmium or Copper. Arch. Environ. Contam. Toxicol.52(2): 229-234.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Growth	NR	Whole Organism	T	50	NA	NR	ug/L	LAB	1995. Hwang, P.P., S.W. Lin, and H.C. Lin. Different Sensitivities to Cadmium in Tilapia Larvae (Oreochromis mossambicus; Teleostei). Arch. Environ. Contam. Toxicol.29(1): 1-7.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Growth	NR	Whole Organism	T	200	NA	NR	ug/L	LAB	1995. Hwang, P.P., S.W. Lin, and H.C. Lin. Different Sensitivities to Cadmium in Tilapia Larvae (Oreochromis mossambicus; Teleostei). Arch. Environ. Contam. Toxicol.29(1): 1-7.
Sulfuric acid, Cadmium salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	%	LAB	1995. Sheela, M., G. Mallika, and S. Muniandy. Impact of Cadmium on Food Utilization, Growth and Body Composition in the Fish Oreochromis mossambicus. Environ. Ecol.13(2): 410-414.
Sulfuric acid, Cadmium salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC16	Not Reported	T	13640		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	205	NA	NR	ug/L	LAB	1995. Hwang, P.P., S.W. Lin, and H.C. Lin. Different Sensitivities to Cadmium in Tilapia Larvae (Oreochromis mossambicus; Teleostei). Arch. Environ. Contam. Toxicol.29(1): 1-7.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	22	NA	NR	ug/L	LAB	1995. Hwang, P.P., S.W. Lin, and H.C. Lin. Different Sensitivities to Cadmium in Tilapia Larvae (Oreochromis mossambicus; Teleostei). Arch. Environ. Contam. Toxicol.29(1): 1-7.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	29	NA	NR	ug/L	LAB	1995. Hwang, P.P., S.W. Lin, and H.C. Lin. Different Sensitivities to Cadmium in Tilapia Larvae (Oreochromis mossambicus; Teleostei). Arch. Environ. Contam. Toxicol.29(1): 1-7.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	33	NA	NR	ug/L	LAB	1995. Hwang, P.P., S.W. Lin, and H.C. Lin. Different Sensitivities to Cadmium in Tilapia Larvae (Oreochromis mossambicus; Teleostei). Arch. Environ. Contam. Toxicol.29(1): 1-7.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	83	NA	NR	ug/L	LAB	1995. Hwang, P.P., S.W. Lin, and H.C. Lin. Different Sensitivities to Cadmium in Tilapia Larvae (Oreochromis mossambicus; Teleostei). Arch. Environ. Contam. Toxicol.29(1): 1-7.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	0.19	NR	NR	uM	LAB	1998. Chang, M.H., H.C. Lin, and P.P. Hwang. Ca2+ Uptake and Cd2+ Accumulation in Larval Tilapia (Oreochromis mossambicus) Acclimated to Waterborne Cd2+. Am. J. Physiol., Regul. Integr. Comp. Physiol.27(6): 1570-1577.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1989. Gaikwad, S.A.. Effects of Mixture and Three Individual Heavy Metals on Susceptibility of Three Fresh Water Fishes. Pollut. Res.8(1): 33-35.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	2.28	NR	NR	uM	LAB	1998. Chang, M.H., H.C. Lin, and P.P. Hwang. Ca2+ Uptake and Cd2+ Accumulation in Larval Tilapia (Oreochromis mossambicus) Acclimated to Waterborne Cd2+. Am. J. Physiol., Regul. Integr. Comp. Physiol.27(6): 1570-1577.
Sulfuric acid, Cadmium salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	16710		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Sulfuric acid, Cadmium salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	%	LAB	1995. Sheela, M., G. Mallika, and S. Muniandy. Impact of Cadmium on Food Utilization, Growth and Body Composition in the Fish Oreochromis mossambicus. Environ. Ecol.13(2): 410-414.
Sulfuric acid, Cadmium salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	NR	NR	ug/L	LAB	1999. James, R., and K. Sampath. Effect of Zeolite on the Reduction of Cadmium Toxicity in Water and a Freshwater Fish, Oreochromis mossambicus. Bull. Environ. Contam. Toxicol.62(2): 222-229.
Sulfuric acid, Cadmium salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	16700	NA	NR	ug/L	LAB	1992. James, R., K. Sampath, and K.P. Ponmani. Effect of Metal Mixtures on Activity of Two Respiratory Enzymes and Their Recovery in Oreochromis mossambicus (Peters). Indian J. Exp. Biol.30(6): 496-499.
Sulfuric acid, Cadmium salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC84	Not Reported	T	23790		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	40	NR	NR	ug/L	LAB	2007. Wu, S.M., Y.C. Ho, and M.J. Shih. Effects of Ca2+ or Na+ on Metallothionein Expression in Tilapia Larvae (Oreochromis mossambicus) Exposed to Cadmium or Copper. Arch. Environ. Contam. Toxicol.52(2): 229-234.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Cadmium salt	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1990. Fu, H., and R.A.C. Lock. Pituitary Response to Cadmium During the Early Development of Tilapia (Oreochromis mossambicus). Aquat. Toxicol.16(1): 9-18.
Cadmium	Mozambique Tilapia	Fish	NR	Mortality	NR	Not Reported	T	250000	NA	NR	ug/L	LAB	1979. Banerjee, S.K., P.K. Mukhopadhyay, and P.V. Dehadrai. Studies of Environmental Pollutants on Air-Breathing Fish (Clarias batrachus, L.) and Non-Air-Breathing Fish (Tilapia mossambica Peters). In: S.W.Nielsen, G.Magaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 378.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50	NR	NR	ug/L	LAB	2007. Wu, S.M., Y.C. Ho, and M.J. Shih. Effects of Ca2+ or Na+ on Metallothionein Expression in Tilapia Larvae (Oreochromis mossambicus) Exposed to Cadmium or Copper. Arch. Environ. Contam. Toxicol.52(2): 229-234.
Cadmium	Mozambique Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Pelgrom, S.M.G.J., L.P.M. Lamers, A. Haaijman, P.H.M. Balm, R.A.C. Lock, and S.E. Wendelaar Bonga. Interactions Between Copper and Cadmium During Single or Combined Metal Exposures in the Teleost Fish Oreochromis mossambicus: Heavy Metal Accumulation and Endocrine Events. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 6, Fishing News Books, London: 62-74.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.18	NR	NR	uM	LAB	1998. Chang, M.H., H.C. Lin, and P.P. Hwang. Ca2+ Uptake and Cd2+ Accumulation in Larval Tilapia (Oreochromis mossambicus) Acclimated to Waterborne Cd2+. Am. J. Physiol., Regul. Integr. Comp. Physiol.27(6): 1570-1577.
Cadmium chloride (CdCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.45	NR	NR	uM	LAB	1998. Chang, M.H., H.C. Lin, and P.P. Hwang. Ca2+ Uptake and Cd2+ Accumulation in Larval Tilapia (Oreochromis mossambicus) Acclimated to Waterborne Cd2+. Am. J. Physiol., Regul. Integr. Comp. Physiol.27(6): 1570-1577.
Sulfuric acid, Cadmium salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	29000		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Cadmium	Mullet	Fish	NR	Mortality	LC50	Not Reported	T	25200	NA	NR	ug/L	LAB	1993. Hou, L., H. Zhao, and Y. Wu. Acute Intoxication of Some Heavy Metals to Mugil So-luy and the Avoidance Reaction of Mugil So-luy. Oceanol. Limnol. Sin. (Haiyang Yu Huzhao)24(5): 507-510.
Cadmium	Mullet	Fish	NR	Mortality	LC50	Not Reported	T	14500	NA	NR	ug/L	LAB	1993. Hou, L., H. Zhao, and Y. Wu. Acute Intoxication of Some Heavy Metals to Mugil So-luy and the Avoidance Reaction of Mugil So-luy. Oceanol. Limnol. Sin. (Haiyang Yu Huzhao)24(5): 507-510.
Cadmium chloride (CdCl2)	Mummichog	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1975. Voyer, R.A., P.P. Yevich, and C.A. Barszcz. Histological and Toxicological Responses of the Mummichog, Fundulus heteroclitus (L.) to Combinations of Levels of Cadmium and Dissolved Oxygen. Water Res.9: 1069-1074.
Cadmium chloride (CdCl2)	Mummichog	Fish	Fresh	Mortality	LC50	Not Reported	T	1900	NA	NR	ug/L	LAB	1975. Voyer, R.A., P.P. Yevich, and C.A. Barszcz. Histological and Toxicological Responses of the Mummichog, Fundulus heteroclitus (L.) to Combinations of Levels of Cadmium and Dissolved Oxygen. Water Res.9: 1069-1074.
Cadmium chloride (CdCl2)	Mummichog	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1975. Voyer, R.A., P.P. Yevich, and C.A. Barszcz. Histological and Toxicological Responses of the Mummichog, Fundulus heteroclitus (L.) to Combinations of Levels of Cadmium and Dissolved Oxygen. Water Res.9: 1069-1074.
Cadmium chloride (CdCl2)	Mummichog	Fish	Fresh	Mortality	LC50*	Not Reported	T	68.3	NA	NR	ug/L	LAB	1992. Gill, T.S., and A. Epple. Impact of Cadmium on the Mummichog Fundulus heteroclitus and the Role of Calcium in Suppressing Heavy Metal Toxicity. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.101(3): 519-523.
Cadmium chloride (CdCl2)	Mummichog	Fish	Fresh	Mortality	LC50*	Not Reported	T	45.2	NA	NR	ug/L	LAB	1992. Gill, T.S., and A. Epple. Impact of Cadmium on the Mummichog Fundulus heteroclitus and the Role of Calcium in Suppressing Heavy Metal Toxicity. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.101(3): 519-523.
Cadmium chloride (CdCl2)	Mummichog	Fish	Fresh	Mortality	LC50*	Not Reported	T	12.2	NA	NR	ug/L	LAB	1992. Gill, T.S., and A. Epple. Impact of Cadmium on the Mummichog Fundulus heteroclitus and the Role of Calcium in Suppressing Heavy Metal Toxicity. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.101(3): 519-523.
Nitric acid, Cadmium salt	Mummichog	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2800*	NA	NR	ug/L	LAB	1915. Thomas, A.. Effects of Certain Metallic Salts upon Fishes. Trans. Am. Fish. Soc.44: 120-124.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	uM	LAB	2008. Atli, G., and M. Canli. Responses of Metallothionein and Reduced Glutathione in a Freshwater Fish Oreochromis niloticus Following Metal Exposures. Environ. Toxicol. Pharmacol.25(1): 33-38.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	uM	LAB	2008. Atli, G., and M. Canli. Responses of Metallothionein and Reduced Glutathione in a Freshwater Fish Oreochromis niloticus Following Metal Exposures. Environ. Toxicol. Pharmacol.25(1): 33-38.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEL	Whole Organism	T	20		NC	uM	LAB	2007. Atli, G., and M. Canli. Enzymatic Responses to Metal Exposures in a Freshwater Fish Oreochromis niloticus. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.145(2): 282-287.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEL	Whole Organism	T	20		NC	uM	LAB	2007. Atli, G., and M. Canli. Enzymatic Responses to Metal Exposures in a Freshwater Fish Oreochromis niloticus. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.145(2): 282-287.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1982. Andaya, A.A., and E.U. Gotopeng. Cadmium Toxicity and Uptake in Tilapia nilotica. Kalikasan (Philipp. J. Biol.)11(2-3): 309-318.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	8075	NR	NR	ug/L	LAB	1993. El-Bouhy, Z., A.M. Alkelch, G. Saleh, and A.M. Ali. Effects of Heavy Metals intoxication on Some Fresh Water Fish. Zag.J.Pharm.Sci.2(2): 73-90.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	19919	NA	NR	ug/L	LAB	1994. Annune, P.A., S.O. Ebele, and A.A. Oladimeji. Acute Toxicity of Cadmium to Juveniles of Clarias gariepinus (Teugels) and Oreochromis niloticus (Trewavas). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control29(7): 1357-1365.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	5200	NA	NR	ug/L	LAB	1988. Al Akel, A.S., M.J.K. Shamsi, H.F. Al Kahem, M.A. Chaudhary, and Z. Ahmad. Effect of Cadmium on the Cichlid Fish, Oreochromis niloticus: Behavioural and Physiological Responses. J. Univ. Kuwait Sci.15(2): 341-345.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	8075	NR	NR	ug/L	LAB	1993. El-Bouhy, Z., A.M. Alkelch, G. Saleh, and A.M. Ali. Effects of Heavy Metals intoxication on Some Fresh Water Fish. Zag.J.Pharm.Sci.2(2): 73-90.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NR	NR	ug/L	LAB	1999. Kargin, F., and H.Y. Cogun. Metal Interactions During Accumulation and Elimination of Zinc and Cadmium in Tissues of the Freshwater Fish Tilapia nilotica. Bull. Environ. Contam. Toxicol.63(4): 511-519.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2008. Oner, M., G. Atli, and M. Canli. Changes in Serum Biochemical Parameters of Freshwater Fish Oreochromis niloticus Following Prolonged Metal (Ag, Cd, Cr, Cu, Zn) Exposures. Environ. Toxicol. Chem.27(2): 360-366.
Cadmium chloride (CdCl2)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.
Cadmium chloride (CdCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1092	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Cadmium chloride (CdCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1104	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Cadmium chloride (CdCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1042	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Cadmium chloride (CdCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1062	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Cadmium chloride (CdCl2)	Northern Squawfish	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Cadmium chloride (CdCl2)	Northern Squawfish	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Cadmium chloride (CdCl2)	Orangethroat Darter	Fish	Fresh	Growth	EC50	Not Reported	T	364	NA	NR	ug/L	LAB	1988. Sharp, J.R., and J.L. Kaszubski. The Influence of Exposure Duration on the Embryotoxicity of Cadmium to the Freshwater Teleost, Etheostoma spectabile. In: D.D.Hemphill (Ed.), Trace Substances in Environ.Health, Univ.of Missouri, Annu.Conf.St.Louis, MO22: 277-289.
Cadmium chloride (CdCl2)	Orangethroat Darter	Fish	Fresh	Growth	EC50	Not Reported	T	348	NA	NR	ug/L	LAB	1988. Sharp, J.R., and J.L. Kaszubski. The Influence of Exposure Duration on the Embryotoxicity of Cadmium to the Freshwater Teleost, Etheostoma spectabile. In: D.D.Hemphill (Ed.), Trace Substances in Environ.Health, Univ.of Missouri, Annu.Conf.St.Louis, MO22: 277-289.
Cadmium chloride (CdCl2)	Orangethroat Darter	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Sharp, J.R., and J.L. Kaszubski. The Influence of Exposure Duration on the Embryotoxicity of Cadmium to the Freshwater Teleost, Etheostoma spectabile. In: D.D.Hemphill (Ed.), Trace Substances in Environ.Health, Univ.of Missouri, Annu.Conf.St.Louis, MO22: 277-289.
Cadmium chloride (CdCl2)	Pearlspot	Fish	Fresh	Mortality	LC50	Not Reported	T	4400	NA	NR	ug/L	LAB	1989. Gaikwad, S.A.. Effects of Mixture and Three Individual Heavy Metals on Susceptibility of Three Fresh Water Fishes. Pollut. Res.8(1): 33-35.
Sulfuric acid, Cadmium salt (1:1)	Pejerrey	Fish	Fresh	Growth	LOEC	Whole Organism	T	8.92	NR	NR	ug/L	LAB	2008. Carriquiriborde, P., and A.E. Ronco. Distinctive Accumulation Patterns of Cd(II), Cu(II), and Cr(VI) in Tissue of the South American Teleost, Pejerrey (Odontesthes bonariensis). Aquat. Toxicol.86(2): 313-322.
Sulfuric acid, Cadmium salt (1:1)	Pejerrey	Fish	Fresh	Growth	NOEC	Whole Organism	T	4.62	NR	NR	ug/L	LAB	2008. Carriquiriborde, P., and A.E. Ronco. Distinctive Accumulation Patterns of Cd(II), Cu(II), and Cr(VI) in Tissue of the South American Teleost, Pejerrey (Odontesthes bonariensis). Aquat. Toxicol.86(2): 313-322.
Sulfuric acid, Cadmium salt (1:1)	Pejerrey	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Carriquiriborde, P., and A.E. Ronco. Distinctive Accumulation Patterns of Cd(II), Cu(II), and Cr(VI) in Tissue of the South American Teleost, Pejerrey (Odontesthes bonariensis). Aquat. Toxicol.86(2): 313-322.
Sulfuric acid, Cadmium salt (1:1)	Pejerrey	Fish	Fresh	Mortality	NR	Not Reported	T	8.92	NR	NR	ug/L	LAB	2008. Carriquiriborde, P., and A.E. Ronco. Distinctive Accumulation Patterns of Cd(II), Cu(II), and Cr(VI) in Tissue of the South American Teleost, Pejerrey (Odontesthes bonariensis). Aquat. Toxicol.86(2): 313-322.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Pejerrey	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	4.62	NR	NR	ug/L	LAB	2008. Carriquiriborde, P., and A.E. Ronco. Distinctive Accumulation Patterns of Cd(II), Cu(II), and Cr(VI) in Tissue of the South American Teleost, Pejerrey (Odontesthes bonariensis). Aquat. Toxicol.86(2): 313-322.
Cadmium chloride (CdCl2)	Pink Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	2700	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Cadmium chloride (CdCl2)	Pink Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	3160	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Cadmium chloride (CdCl2)	Pink Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	3650	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Cadmium	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	6620	NA	NR	ug/L	LAB	1988. Carrier, R., and T.L. Beitinger. Reduction in Thermal Tolerance of Notropis lutrensis and Pimephales promelas Exposed to Cadmium. Water Res.22(4): 511-515.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	EC10	Whole Organism	D	2.6		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	EC10	Whole Organism	D	0.15		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	EC10	Whole Organism	D	1.3		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	EC20	Whole Organism	D	6.8		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	EC20	Whole Organism	D	1.8		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	2.7		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	D	0.16		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	D	6.9		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	D	0.16		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	D	2.9		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	MATC	Not Reported	T	1.9		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	MATC	Whole Organism	D	4.4		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	MATC	Whole Organism	D	1.9		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	1.3		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	D	2.9		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	D	1.3		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	5.2		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	2000	NR	NR	ug/L	LAB	1986. Halsband, E., I. Halsband, B. Romestand, A. Dzuvic, and H. Pump. Further Investigations on the Impact of Cadmium, Calcium and Parathormone on Blood, Skeleton System and Internal Organs of Rainbow Trout Salmo gairdneri (Weitere Untersuchungen ober die Wirkung von Cadmium, Calcium und P. Veroeff.Inst.Kuest.Binnenfisch.Hamb.No.91: 29 p..
Cadmium	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Cadmium	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1984. Roch, M., and J.A. McCarter. Hepatic Metallothionein Production and Resistance to Heavy Metals by Rainbow Trout (Salmo gairdneri)-II. Held in a Series of Contaminated Lakes. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.77(1): 77-82.
Cadmium	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	2000	NR	NR	ug/L	LAB	1986. Halsband, E., I. Halsband, B. Romestand, A. Dzuvic, and H. Pump. Further Investigations on the Impact of Cadmium, Calcium and Parathormone on Blood, Skeleton System and Internal Organs of Rainbow Trout Salmo gairdneri (Weitere Untersuchungen ober die Wirkung von Cadmium, Calcium und P. Veroeff.Inst.Kuest.Binnenfisch.Hamb.No.91: 29 p..
Cadmium	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Cadmium	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	2000	NR	NR	ug/L	LAB	1986. Halsband, E., I. Halsband, B. Romestand, A. Dzuvic, and H. Pump. Further Investigations on the Impact of Cadmium, Calcium and Parathormone on Blood, Skeleton System and Internal Organs of Rainbow Trout Salmo gairdneri (Weitere Untersuchungen ober die Wirkung von Cadmium, Calcium und P. Veroeff.Inst.Kuest.Binnenfisch.Hamb.No.91: 29 p..
Cadmium	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Ricard, A.C., C. Daniel, P. Anderson, and A. Hontela. Effects of Subchronic Exposure to Cadmium Chloride on Endocrine and Metabolic Functions in Rainbow Trout Oncorhynchus mykiss. Arch. Environ. Contam. Toxicol.34(4): 377-381.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Ricard, A.C., C. Daniel, P. Anderson, and A. Hontela. Effects of Subchronic Exposure to Cadmium Chloride on Endocrine and Metabolic Functions in Rainbow Trout Oncorhynchus mykiss. Arch. Environ. Contam. Toxicol.34(4): 377-381.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	400	NA	NR	ug/L	LAB	1996. Hontela, A., C. Daniel, and A.C. Ricard. Effects of Acute and Subacute Exposures to Cadmium on the Interrenal and Thyroid Function in Rainbow Trout, Oncorhynchus mykiss. Aquat. Toxicol.35(3-4): 171-182.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. Lowe-Jinde, L., and A.J. Niimi. Short-Term and Long-Term Effects of Cadmium on Glycogen Reserves and Liver Size in Rainbow Trout (Salmo gairdneri Richardson). Arch. Environ. Contam. Toxicol.13(6): 759-764.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	2	NA	NR	ug/L	LAB	1995. Zelikoff, J.T., D. Bowser, K.S. Squibb, and K. Frenkel. Immunotoxicity of Low Level Cadmium Exposure in Fish: An Alternative Animal Model for Immunotoxicological Studies. J. Toxicol. Environ. Health45(3): 235-248.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	4	NA	NR	ug/L	LAB	1980. Kumada, H., S. Kimura, and M. Yokote. Accumulation and Biological Effects of Cadmium in Rainbow Trout. Nippon Suisan Gakkaishi46(1): 97-103.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	6.4	NA	NR	ug/L	LAB	1988. Giles, M.A.. Accumulation of Cadmium by Rainbow Trout, Salmo gairdneri, During Extended Exposure. Can. J. Fish. Aquat. Sci.45(6): 1045-1053.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	124	NA	NR	ug/L	LAB	1982. Woodworth, J., and D. Pascoe. Cadmium Toxicity to Rainbow Trout, Salmo gairdneri Richardson: A Study of Eggs and Alevins. J. Fish Biol.21(1): 47-57.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	14	NA	NR	ug/L	LAB	1982. Woodworth, J., and D. Pascoe. Cadmium Toxicity to Rainbow Trout, Salmo gairdneri Richardson: A Study of Eggs and Alevins. J. Fish Biol.21(1): 47-57.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	36.5	NA	NR	ug/L	LAB	1986. Lowe-Jinde, L., and A.J. Niimi. Hematological Characteristics of Rainbow Trout, Salmo gairdneri (Richardson), in Response to Cadmium Exposure. Bull. Environ. Contam. Toxicol.37(3): 375-381.
Nitric acid, Cadmium salt	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1999. Hollis, L., J.C. McGeer, D.G. McDonald, and C.M. Wood. Cadmium Accumulation, Gill Cd Binding, Acclimation, and Physiological Effects During Long Term Sublethal Cd Exposure in Rainbow Trout. Aquat. Toxicol.46(2): 101-119.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC10	Not Reported	D	0.82		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC10	Not Reported	D	1.6		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC10	Not Reported	D	0.89		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC20	Not Reported	D	1.2		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC20	Not Reported	D	2.2		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC20	Not Reported	D	1.2		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	T	8	NR	NR	ug/L	LAB	1981. Birge, W.J., J.A. Black, and B.A. Ramey. The Reproductive Toxicology of Aquatic Contaminants. In: J.Saxena and F.Fisher (Eds.), Hazard Assessment of Chemicals: Current Developments, Academic Press, New York, NY1: 59-115.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	D	1.22		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	D	3.34		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	D	4.18		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	L	0.2		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	L	0.37		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	L	2.58		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	T	1.34		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	T	1.69		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	T	1.91		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	T	22		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	T	5.65		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	T	6.06		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	29.2	NR	NR	ug/L	LAB	1981. Birge, W.J., J.A. Black, and B.A. Ramey. The Reproductive Toxicology of Aquatic Contaminants. In: J.Saxena and F.Fisher (Eds.), Hazard Assessment of Chemicals: Current Developments, Academic Press, New York, NY1: 59-115.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.29	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.3	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.46	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.55	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	1.59	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.25	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.28	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.29	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.34	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	0.5	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	1.32	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4200	NA	NR	ug/L	LAB	1973. Kumada, H., S. Kimura, M. Yokote, and Y. Matida. Acute and Chronic Toxicity, Uptake and Retention of Cadmium in Freshwater Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)22(2): 157-165.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1973. Kumada, H., S. Kimura, M. Yokote, and Y. Matida. Acute and Chronic Toxicity, Uptake and Retention of Cadmium in Freshwater Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)22(2): 157-165.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1973. Kumada, H., S. Kimura, M. Yokote, and Y. Matida. Acute and Chronic Toxicity, Uptake and Retention of Cadmium in Freshwater Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)22(2): 157-165.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1973. Kumada, H., S. Kimura, M. Yokote, and Y. Matida. Acute and Chronic Toxicity, Uptake and Retention of Cadmium in Freshwater Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)22(2): 157-165.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	358	NA	NR	ug/L	LAB	1980. Calamari, D., R. Marchetti, and G. Vailati. Influence of Water Hardness on Cadmium Toxicity to Salmo gairdneri Rich. Water Res.14(10): 1421-1426.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3698	NA	NR	ug/L	LAB	1980. Calamari, D., R. Marchetti, and G. Vailati. Influence of Water Hardness on Cadmium Toxicity to Salmo gairdneri Rich. Water Res.14(10): 1421-1426.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	677	NA	NR	ug/L	LAB	1980. Calamari, D., R. Marchetti, and G. Vailati. Influence of Water Hardness on Cadmium Toxicity to Salmo gairdneri Rich. Water Res.14(10): 1421-1426.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	91	NA	NR	ug/L	LAB	1980. Calamari, D., R. Marchetti, and G. Vailati. Influence of Water Hardness on Cadmium Toxicity to Salmo gairdneri Rich. Water Res.14(10): 1421-1426.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9	NA	NR	ug/L	LAB	1973. Kumada, H., S. Kimura, M. Yokote, and Y. Matida. Acute and Chronic Toxicity, Uptake and Retention of Cadmium in Freshwater Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)22(2): 157-165.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1973. Kumada, H., S. Kimura, M. Yokote, and Y. Matida. Acute and Chronic Toxicity, Uptake and Retention of Cadmium in Freshwater Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)22(2): 157-165.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1160	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6	NA	NR	ug/L	LAB	1973. Kumada, H., S. Kimura, M. Yokote, and Y. Matida. Acute and Chronic Toxicity, Uptake and Retention of Cadmium in Freshwater Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)22(2): 157-165.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.35	NR	NR	ug/L	LAB	1986. Roch, M., and J.A. McCarter. Survival and Hepatic Metallothionein in Developing Rainbow Trout Exposed to a Mixture of Zinc, Copper, and Cadmium. Bull. Environ. Contam. Toxicol.36: 168-175.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1967. Ball, I.R.. The Toxicity of Cadmium to Rainbow Trout (Salmo gairnderii Richardson). Water Res.1: 805-806.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Ball, I.R.. The Toxicity of Cadmium to Rainbow Trout (Salmo gairnderii Richardson). Water Res.1: 805-806.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.1	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.64	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.69	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.95	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3.08	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4.2	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.47	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.68	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.92	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6.57	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7.4	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7.71	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.5		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3.7		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.2		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	0.84		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	0.89		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	2.5		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1979. Chouikhi, A.. Choice and Set Up of the Food Chains in Freshwater in Order to Show the Bioaccumulation Character of a Pollutant. OECD-IRCHA Universite Paris-Sud, Unite d'Enseignement et de Recherche d'Hygiene et Protection de l'Homme et de son Environnement.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4.2	NA	NR	ug/L	LAB	1980. Kumada, H., S. Kimura, and M. Yokote. Accumulation and Biological Effects of Cadmium in Rainbow Trout. Nippon Suisan Gakkaishi46(1): 97-103.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1980. Kumada, H., S. Kimura, and M. Yokote. Accumulation and Biological Effects of Cadmium in Rainbow Trout. Nippon Suisan Gakkaishi46(1): 97-103.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.2	NR	NR	ug/L	LAB	1978. Chapman, G.A., and D.G. Stevens. Acutely Lethal Levels of Cadmium, Copper, and Zinc to Adult Male Coho Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 837-840.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	12500	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	16500	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3300	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5800	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7200	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8300	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1950	NR	NR	ug/L	LAB	1997. Oryan, S., and P. Nejatkhah. Effects of Cadmium on Plasma Cortisol and Prolactin Levels in the Rainbow Trout (Oncorhynchus mykiss). J. Fac. Vet. Med. Univ. Tehran51(3-4): 39-53.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1986. Pascoe, D., S.A. Evans, and J. Woodworth. Heavy Metal Toxicity to Fish and the Influence of Water Hardness. Arch. Environ. Contam. Toxicol.15(5): 481-487.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5700	NA	NR	ug/L	LAB	1986. Pascoe, D., S.A. Evans, and J. Woodworth. Heavy Metal Toxicity to Fish and the Influence of Water Hardness. Arch. Environ. Contam. Toxicol.15(5): 481-487.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1979. Chouikhi, A.. Choice and Set Up of the Food Chains in Freshwater in Order to Show the Bioaccumulation Character of a Pollutant. OECD-IRCHA Universite Paris-Sud, Unite d'Enseignement et de Recherche d'Hygiene et Protection de l'Homme et de son Environnement.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9	NA	NR	ug/L	LAB	1980. Kumada, H., S. Kimura, and M. Yokote. Accumulation and Biological Effects of Cadmium in Rainbow Trout. Nippon Suisan Gakkaishi46(1): 97-103.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	1997. Oryan, S., and P. Nejatkhah. Effects of Cadmium on Plasma Cortisol and Prolactin Levels in the Rainbow Trout (Oncorhynchus mykiss). J. Fac. Vet. Med. Univ. Tehran51(3-4): 39-53.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Woodall, C., N. MacLean, and F. Crossley. Responses of Trout Fry (Salmo gairdneri) and Xenopus laevis Tadpoles to Cadmium and Zinc. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.89(1): 93-99.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.32	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.38	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.38	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.38	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.44	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.47	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.51	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.6	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.71	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.83	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.29	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.75	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.85	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4.06	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.3	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NA	NR	ug/L	LAB	1985. Phipps, G.L., and G.W. Holcombe. A Method for Aquatic Multiple Species Toxicant Testing: Acute Toxicity of 10 Chemicals to 5 Vertebrates and 2 Invertebrates. Environ. Pollut. A.38(2): 141-157.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.7	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NR	NR	ug/L	LAB	1981. Daoust, P.Y.. Acute Pathological Effects of Mercury, Cadmium and Copper in Rainbow Trout. Ph.D.Thesis, Saskatoon, Saskatchewan: 331 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	28	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	450	NR	NR	ug/L	LAB	1997. Oryan, S., and P. Nejatkhah. Effects of Cadmium on Plasma Cortisol and Prolactin Levels in the Rainbow Trout (Oncorhynchus mykiss). J. Fac. Vet. Med. Univ. Tehran51(3-4): 39-53.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.4		NR	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1986. Pascoe, D., S.A. Evans, and J. Woodworth. Heavy Metal Toxicity to Fish and the Influence of Water Hardness. Arch. Environ. Contam. Toxicol.15(5): 481-487.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2600	NA	NR	ug/L	LAB	1986. Pascoe, D., S.A. Evans, and J. Woodworth. Heavy Metal Toxicity to Fish and the Influence of Water Hardness. Arch. Environ. Contam. Toxicol.15(5): 481-487.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10*	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., P.S. Griffioen, W.H.A. Vergouw, and J.L. Maas-Diepeveen. Differences in Susceptibility of Early Life Stages of Rainbow Trout (Salmo gairdneri) to Environmental Pollutants. Aquat. Toxicol.7(1/2): 59-78.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20*	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., P.S. Griffioen, W.H.A. Vergouw, and J.L. Maas-Diepeveen. Differences in Susceptibility of Early Life Stages of Rainbow Trout (Salmo gairdneri) to Environmental Pollutants. Aquat. Toxicol.7(1/2): 59-78.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4700*	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., P.S. Griffioen, W.H.A. Vergouw, and J.L. Maas-Diepeveen. Differences in Susceptibility of Early Life Stages of Rainbow Trout (Salmo gairdneri) to Environmental Pollutants. Aquat. Toxicol.7(1/2): 59-78.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5700*	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., P.S. Griffioen, W.H.A. Vergouw, and J.L. Maas-Diepeveen. Differences in Susceptibility of Early Life Stages of Rainbow Trout (Salmo gairdneri) to Environmental Pollutants. Aquat. Toxicol.7(1/2): 59-78.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8000*	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., P.S. Griffioen, W.H.A. Vergouw, and J.L. Maas-Diepeveen. Differences in Susceptibility of Early Life Stages of Rainbow Trout (Salmo gairdneri) to Environmental Pollutants. Aquat. Toxicol.7(1/2): 59-78.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8000*	NA	NR	ug/L	LAB	1985. Van Leeuwen, C.J., P.S. Griffioen, W.H.A. Vergouw, and J.L. Maas-Diepeveen. Differences in Susceptibility of Early Life Stages of Rainbow Trout (Salmo gairdneri) to Environmental Pollutants. Aquat. Toxicol.7(1/2): 59-78.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 74 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.6	NA	NR	ug/L	LAB	1981. Call, D.J., L.T. Brooke, N. Ahmad, and D.D. Vaishnav. Aquatic Pollutant Hazard Assessments and Development of a Hazard Prediction Technology by Quantitative Structure-Activity Relationships. Second Quarterly Rep., U.S.EPA Coop.Agreement No.CR 809234-01-0, Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin, Superior, WI: 74 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10.2	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.3	NA	NR	ug/L	LAB	1984. Spehar, R.L., and A.R. Carlson. Derivation of Site-Specific Water Quality Criteria for Cadmium and the St. Louis River Basin, Duluth, Minnesota. Environ. Toxicol. Chem.3(4): 651-665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1979. Chouikhi, A.. Choice and Set Up of the Food Chains in Freshwater in Order to Show the Bioaccumulation Character of a Pollutant. OECD-IRCHA Universite Paris-Sud, Unite d'Enseignement et de Recherche d'Hygiene et Protection de l'Homme et de son Environnement.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	37.9	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6	NA	NR	ug/L	LAB	1980. Kumada, H., S. Kimura, and M. Yokote. Accumulation and Biological Effects of Cadmium in Rainbow Trout. Nippon Suisan Gakkaishi46(1): 97-103.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.6	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.35	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.35	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.36	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.38	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.38	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.38	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.39	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.39	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.53	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.58	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.62	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.84	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.91	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.25	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.07	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.33	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.89	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.1	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.58	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.9	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.58	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.9	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.7	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6.3	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.9	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.3	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.6	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
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Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
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Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	940	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	43	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1980. Black, J.A., and W.J. Birge. An Avoidance Response Bioassay for Aquatic Pollutants. Res.Report No.123, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 34-180490.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	16	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	1.83		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	13.1		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	2.67		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	8.3		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	L	0.85		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	L	0.86		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	L	6.84		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	L	8.78		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10.5		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13.4		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.09		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.79		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8.54		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	14.3		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3.25		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	49.9		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NA	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-11, DNR, Boulder, CO: 58 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.85	NR	NR	ug/L	LAB	1975. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-10, Jan 1-Dec 31, 1974, Colorado: 29 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	450	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	1.75	NA	NR	ug/L	LAB	1976. Davies, P.. Use of Dialysis Tubing in Defining the Toxic Fractions of Heavy Metals in Natural Waters. In: R.W.Andrew, P.V.Hodson, and D.E.Konasewich (Eds.) Toxicity to Biota of Metal Forms in Nat.Water, Int.Joint Comm., Windsor, Canada: 110-117.
Nitric acid, Cadmium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Nitric acid, Cadmium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	169	NR	NR	nmol/L	LAB	2004. Niyogi, S., P. Couture, G. Pyle, D.G. McDonald, and C.M. Wood. Acute Cadmium Biotic Ligand Model Characteristics of Laboratory-Reared and Wild Yellow Perch (Perca flavescens) Relative to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.61(6): 942-953.
Nitric acid, Cadmium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6.6	NR	NR	ug/L	LAB	1977. Hale, J.G.. Toxicity of Metal Mining Wastes. Bull. Environ. Contam. Toxicol.17(1): 66-73.
Nitric acid, Cadmium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	22	NR	NR	ug/L	LAB	1999. Hollis, L., J.C. McGeer, D.G. McDonald, and C.M. Wood. Cadmium Accumulation, Gill Cd Binding, Acclimation, and Physiological Effects During Long Term Sublethal Cd Exposure in Rainbow Trout. Aquat. Toxicol.46(2): 101-119.
Nitric acid, Cadmium salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Hollis, L., J.C. McGeer, D.G. McDonald, and C.M. Wood. Cadmium Accumulation, Gill Cd Binding, Acclimation, and Physiological Effects During Long Term Sublethal Cd Exposure in Rainbow Trout. Aquat. Toxicol.46(2): 101-119.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	130	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	73.8*	NA	NR	ug/L	LAB	1975. Rausina, G., J.W. Goode, M.L. Keplinger, and J.C. Calandra. Four-Day Static Fish Toxicity Studies Conducted with Thirteen Cadmium Pigments in Three Species of Freshwater Fish. Toxicol. Appl. Pharmacol.33(1): 188.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	6	NA	NR	ug/L	LAB	1985. Stubblefield, W.A., B.L. Steadman, T.W. LaPoint, and H.L. Bergman. Affects of Acclimation upon the Toxicity of Zinc, Cadmium and Phenol on Adult and Fry Rainbow Trout. Am. Fish. Soc. Annu. Meet.115: 3.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	19.4	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	31	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	30	NA	NR	ug/L	LAB	1979. Roch, M., and E.J. Maly. Relationship of Cadmium-Induced Hypocalcemia with Mortality in Rainbow Trout (Salmo gairdneri) and the Influence of Temperature on Toxicity. J. Fish. Res. Board Can.36(11): 1297-1303.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Roch, M., and E.J. Maly. Relationship of Cadmium-Induced Hypocalcemia with Mortality in Rainbow Trout (Salmo gairdneri) and the Influence of Temperature on Toxicity. J. Fish. Res. Board Can.36(11): 1297-1303.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Roch, M., and E.J. Maly. Relationship of Cadmium-Induced Hypocalcemia with Mortality in Rainbow Trout (Salmo gairdneri) and the Influence of Temperature on Toxicity. J. Fish. Res. Board Can.36(11): 1297-1303.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	122.7	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	30.8	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	35.5	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	38.3	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	20	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	6.1	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	57.7	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1.5	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	2.4	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1.5	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	7.1	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	26	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1.74	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	5.03	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	5.16	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	2.7		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	D	1.3		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	D	2.5		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	D	1.3		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	D	1.68		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	D	15.8		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	D	3.55		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	L	0.36		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	L	0.69		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	L	9.8		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1.89		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	14.3		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	14.7		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	2.16		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	2.24		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	25		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1.9	D	0.7	ug/L	LAB	1987. Davies, P.H., and W.C. Gorman. Effects of Chemical Equilibria and Kinetics on the Bioavailability and Toxicity of Cadmium to Rainbow Trout. In: Am.Chem.Soc.Natl.Meeting194: 646-650.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	4	D	0.8	ug/L	LAB	1987. Davies, P.H., and W.C. Gorman. Effects of Chemical Equilibria and Kinetics on the Bioavailability and Toxicity of Cadmium to Rainbow Trout. In: Am.Chem.Soc.Natl.Meeting194: 646-650.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	15.8	D	11.2	ug/L	LAB	1987. Davies, P.H., and W.C. Gorman. Effects of Chemical Equilibria and Kinetics on the Bioavailability and Toxicity of Cadmium to Rainbow Trout. In: Am.Chem.Soc.Natl.Meeting194: 646-650.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	7.9	NR	NR	ug/L	LAB	1975. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-10, Jan 1-Dec 31, 1974, Colorado: 29 p..
Nitric acid, Cadmium salt	Rainbow Trout	Fish	Fresh	Mortality	LR50	Gill(s)	T	531	NR	NR	nmol/L	LAB	2004. Niyogi, S., P. Couture, G. Pyle, D.G. McDonald, and C.M. Wood. Acute Cadmium Biotic Ligand Model Characteristics of Laboratory-Reared and Wild Yellow Perch (Perca flavescens) Relative to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.61(6): 942-953.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	1.47	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	3.64	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	1.9		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	D	0.88		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	D	1.6		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	D	1.26		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	D	2.78		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	D	9.15		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	L	0.22		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	L	0.26		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	L	6.28		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	1.39		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	1.82		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	1.95		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	10.8		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	11.1		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	17.6		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	1.4	D	0.4	ug/L	LAB	1987. Davies, P.H., and W.C. Gorman. Effects of Chemical Equilibria and Kinetics on the Bioavailability and Toxicity of Cadmium to Rainbow Trout. In: Am.Chem.Soc.Natl.Meeting194: 646-650.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	3.5	D	0.4	ug/L	LAB	1987. Davies, P.H., and W.C. Gorman. Effects of Chemical Equilibria and Kinetics on the Bioavailability and Toxicity of Cadmium to Rainbow Trout. In: Am.Chem.Soc.Natl.Meeting194: 646-650.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	9.1	D	6	ug/L	LAB	1987. Davies, P.H., and W.C. Gorman. Effects of Chemical Equilibria and Kinetics on the Bioavailability and Toxicity of Cadmium to Rainbow Trout. In: Am.Chem.Soc.Natl.Meeting194: 646-650.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	MATC*	Not Reported	T	3.58	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.7	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	3.4	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	14.8	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.25	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	2.55	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	2.57	NA	NR	ug/L	LAB	1993. Davies, P.H., W.C. Gorman, C.A. Carlson, and S.F. Brinkman. Effect of Hardness on Bioavailability and Toxicity of Cadmium to Rainbow Trout. Chem. Spec. Bioavail.5(2): 67-77.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.3		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	D	0.6		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	D	1		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.8	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	12	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Cadmium to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	D	0.95		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	D	2.18		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	D	5.3		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	L	0.14		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	L	4.02		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.02		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.48		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.76		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	12.4		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	8.2		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	8.36		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.1	D	0.3	ug/L	LAB	1987. Davies, P.H., and W.C. Gorman. Effects of Chemical Equilibria and Kinetics on the Bioavailability and Toxicity of Cadmium to Rainbow Trout. In: Am.Chem.Soc.Natl.Meeting194: 646-650.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	3	D	0.2	ug/L	LAB	1987. Davies, P.H., and W.C. Gorman. Effects of Chemical Equilibria and Kinetics on the Bioavailability and Toxicity of Cadmium to Rainbow Trout. In: Am.Chem.Soc.Natl.Meeting194: 646-650.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	5.3	D	3.2	ug/L	LAB	1987. Davies, P.H., and W.C. Gorman. Effects of Chemical Equilibria and Kinetics on the Bioavailability and Toxicity of Cadmium to Rainbow Trout. In: Am.Chem.Soc.Natl.Meeting194: 646-650.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	3.7	NR	NR	ug/L	LAB	1975. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-10, Jan 1-Dec 31, 1974, Colorado: 29 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-11, DNR, Boulder, CO: 58 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-11, DNR, Boulder, CO: 58 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-11, DNR, Boulder, CO: 58 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	D	NR	NA	NR	ug/L	LAB	1976. Davies, P.. Use of Dialysis Tubing in Defining the Toxic Fractions of Heavy Metals in Natural Waters. In: R.W.Andrew, P.V.Hodson, and D.E.Konasewich (Eds.) Toxicity to Biota of Metal Forms in Nat.Water, Int.Joint Comm., Windsor, Canada: 110-117.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	D	NR	NA	NR	ug/L	LAB	1976. Davies, P.. Use of Dialysis Tubing in Defining the Toxic Fractions of Heavy Metals in Natural Waters. In: R.W.Andrew, P.V.Hodson, and D.E.Konasewich (Eds.) Toxicity to Biota of Metal Forms in Nat.Water, Int.Joint Comm., Windsor, Canada: 110-117.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Thomas, D.G., A. Cryer, J.F.D.E. Solbe, and J. Kay. A Comparison of the Accumulation and Protein Binding of Environmental Cadmium in the Gills, Kidney and Liver of Rainbow Trout (Salmo. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.76(2): 241-246.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1984. Roch, M., and J.A. McCarter. Hepatic Metallothionein Production and Resistance to Heavy Metals by Rainbow Trout (Salmo gairdneri)-II. Held in a Series of Contaminated Lakes. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.77(1): 77-82.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Water Pollution Research Board. Effects of Pollution on Fish: Chronic Toxicity of Ammonia to Rainbow Trout. In: Water Pollution Research 1967, Water Pollution Research Board, Dep.of Scientific and Industrial Research, H.M.Stationery Office, London: 56-65.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	3000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1987. MacLean, N., C. Woodall, and F. Crossley. Injection of the Mouse MT-1 Gene into Rainbow Trout Eggs and Assay of Trout Fry for Resistance to Cadmium and Zinc Toxicity. In: J.H.R.Kagi and Y.Kojima (Eds.), Experientia Suppl., Volume 52, Metallothionein II, 2nd Int.Meet.on Metallothionein and Other Low Molecular Weight Metal-Binding Proteins, Aug.21-24, 1985, Zurich, Switzerland, Birkhaeuser Verlag, Basel, Switzerland: 471.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1987. MacLean, N., C. Woodall, and F. Crossley. Injection of the Mouse MT-1 Gene into Rainbow Trout Eggs and Assay of Trout Fry for Resistance to Cadmium and Zinc Toxicity. In: J.H.R.Kagi and Y.Kojima (Eds.), Experientia Suppl., Volume 52, Metallothionein II, 2nd Int.Meet.on Metallothionein and Other Low Molecular Weight Metal-Binding Proteins, Aug.21-24, 1985, Zurich, Switzerland, Birkhaeuser Verlag, Basel, Switzerland: 471.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1987. MacLean, N., C. Woodall, and F. Crossley. Injection of the Mouse MT-1 Gene into Rainbow Trout Eggs and Assay of Trout Fry for Resistance to Cadmium and Zinc Toxicity. In: J.H.R.Kagi and Y.Kojima (Eds.), Experientia Suppl., Volume 52, Metallothionein II, 2nd Int.Meet.on Metallothionein and Other Low Molecular Weight Metal-Binding Proteins, Aug.21-24, 1985, Zurich, Switzerland, Birkhaeuser Verlag, Basel, Switzerland: 471.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1987. MacLean, N., C. Woodall, and F. Crossley. Injection of the Mouse MT-1 Gene into Rainbow Trout Eggs and Assay of Trout Fry for Resistance to Cadmium and Zinc Toxicity. In: J.H.R.Kagi and Y.Kojima (Eds.), Experientia Suppl., Volume 52, Metallothionein II, 2nd Int.Meet.on Metallothionein and Other Low Molecular Weight Metal-Binding Proteins, Aug.21-24, 1985, Zurich, Switzerland, Birkhaeuser Verlag, Basel, Switzerland: 471.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	7760	NR	NR	ug/L	LAB	1997. Oryan, S., and P. Nejatkhah. Effects of Cadmium on Plasma Cortisol and Prolactin Levels in the Rainbow Trout (Oncorhynchus mykiss). J. Fac. Vet. Med. Univ. Tehran51(3-4): 39-53.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Yamamoto, Y., and M. Inoue. Lethal Tolerance of Acute Cadmium Toxicity in Rainbow Trout Previously Exposed to Cadmium. Nippon Suisan Gakkaishi51(10): 1733-1735.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	0.162	NA	NR	uM	LAB	1997. Hollis, L., L. Muench, and R.C. Playle. Influence of Dissolved Organic Matter on Copper Binding, and Calcium on Cadmium Binding, by Gills of Rainbow Trout. J. Fish Biol.50: 703-720.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	36.5	NA	NR	ug/L	LAB	1984. Lowe-Jinde, L., and A.J. Niimi. Short-Term and Long-Term Effects of Cadmium on Glycogen Reserves and Liver Size in Rainbow Trout (Salmo gairdneri Richardson). Arch. Environ. Contam. Toxicol.13(6): 759-764.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1973. Bilinski, E., and R.E.E. Jonas. Effects of Cadmium and Copper on the Oxidation of Lactate by Rainbow Trout (Salmo gairdneri) Gills. J. Fish. Res. Board Can.30(10): 1553-1558.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	124	NA	NR	ug/L	LAB	1982. Woodworth, J., and D. Pascoe. Cadmium Toxicity to Rainbow Trout, Salmo gairdneri Richardson: A Study of Eggs and Alevins. J. Fish Biol.21(1): 47-57.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	14	NA	NR	ug/L	LAB	1982. Woodworth, J., and D. Pascoe. Cadmium Toxicity to Rainbow Trout, Salmo gairdneri Richardson: A Study of Eggs and Alevins. J. Fish Biol.21(1): 47-57.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1	NA	NR	ug/L	LAB	1974. Birge, W.J., A.G. Westerman, and O.W. Roberts. Lethal and Teratogenic Effects of Metallic Pollutants on Vertebrate Embryos. In: Proc. 2nd Annu. NSF-Rann Trace Contam. Environ. Conf. , Springfield, VA: 316-320.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1974. Birge, W.J., A.G. Westerman, and O.W. Roberts. Lethal and Teratogenic Effects of Metallic Pollutants on Vertebrate Embryos. In: Proc. 2nd Annu. NSF-Rann Trace Contam. Environ. Conf. , Springfield, VA: 316-320.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Brown, V., D. Shurben, W. Miller, and M. Crane. Cadmium Toxicity to Rainbow Trout Oncorhynchus mykiss Walbaum and Brown Trout Salmo trutta L. over Extended Exposure Periods. Ecotoxicol. Environ. Saf.29: 38-46.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	750	NA	NR	ug/L	LAB	1987. Castren, M., and A. Oikari. Changes of the Liver UDP-Glucuronosyltransferase Activity in Trout (Salmo gairdneri Rich.) Acutely Exposed to Selected Aquatic Toxicants. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 357-360.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1.4	NA	NR	ug/L	LAB	1981. Dave, G., K. Andersson, R. Berglind, and B. Hasselrot. Toxicity of Eight Solvent Extraction Chemicals and of Cadmium to Water Fleas, Daphnia magna, Rainbow Trout, Salmo gairdneri, and Zebrafish, Brachydanio rerio. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.69(1): 83-98.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	52	NA	NR	ug/L	LAB	1977. Hodson, P.V., B.R. Blunt, D.J. Spry, and K. Austen. Evaluation of Erythrocyte delta-Amino Levulinic Acid Dehydratase Activity as a Short-Term Indicator in Fish of a Harmful Exposure to Lead. J. Fish. Res. Board Can.34(4): 501-508.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1987. Gorman, W.C.J., and R.K. Skogerboe. Speciation of Cadmium in Natural Waters and Their Effect on Rainbow Trout. In: Preprints of Papers Presented at the Div.of Environ.Chem., Am.Chem.Soc., Aug.30-Sept.4, 1987, New Orleans, LA:644-645 / Abstr.Pap.Am.Chem.Soc.194: 227.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	7000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8.32		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	39400	NA	NR	ug/L	LAB	1978. Beattie, J.H., and D. Pascoe. Cadmium Uptake by Rainbow Trout, Salmo gairdneri Eggs and Alevins. J. Fish Biol.13(5): 631-637.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	39400	NA	NR	ug/L	LAB	1978. Beattie, J.H., and D. Pascoe. Cadmium Uptake by Rainbow Trout, Salmo gairdneri Eggs and Alevins. J. Fish Biol.13(5): 631-637.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	7700	NA	NR	ug/L	LAB	1978. Beattie, J.H., and D. Pascoe. Cadmium Uptake by Rainbow Trout, Salmo gairdneri Eggs and Alevins. J. Fish Biol.13(5): 631-637.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1978. Beattie, J.H., and D. Pascoe. Cadmium Uptake by Rainbow Trout, Salmo gairdneri Eggs and Alevins. J. Fish Biol.13(5): 631-637.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1974. Birge, W.J., A.G. Westerman, and O.W. Roberts. Lethal and Teratogenic Effects of Metallic Pollutants on Vertebrate Embryos. In: Proc. 2nd Annu. NSF-Rann Trace Contam. Environ. Conf. , Springfield, VA: 316-320.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	124	NA	NR	ug/L	LAB	1982. Woodworth, J., and D. Pascoe. Cadmium Toxicity to Rainbow Trout, Salmo gairdneri Richardson: A Study of Eggs and Alevins. J. Fish Biol.21(1): 47-57.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2500	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	39400	NA	NR	ug/L	LAB	1978. Beattie, J.H., and D. Pascoe. Cadmium Uptake by Rainbow Trout, Salmo gairdneri Eggs and Alevins. J. Fish Biol.13(5): 631-637.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	4.88		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	7.04		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	L	2.11		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	L	5.93		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	23.7		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4.66		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	58.6		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8.78		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	7.68		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	L	6.43		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	7.29		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8.78		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	7	D	6.3	ug/L	LAB	1987. Davies, P.H., and W.C. Gorman. Effects of Chemical Equilibria and Kinetics on the Bioavailability and Toxicity of Cadmium to Rainbow Trout. In: Am.Chem.Soc.Natl.Meeting194: 646-650.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	14.3	NR	NR	ug/L	LAB	1975. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-10, Jan 1-Dec 31, 1974, Colorado: 29 p..
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.7	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.9	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	14.8	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.07		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.3		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Castano, A., G. Carbonell, M. Carballo, C. Fernandez, S. Boleas, and J.V. Tarazona. Sublethal Effects of Repeated Intraperitoneal Cadmium Injections on Rainbow Trout (Oncorhynchus mykiss). Ecotoxicol. Environ. Saf.41: 29-35.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.144	NA	NR	uM	LAB	1997. Hollis, L., L. Muench, and R.C. Playle. Influence of Dissolved Organic Matter on Copper Binding, and Calcium on Cadmium Binding, by Gills of Rainbow Trout. J. Fish Biol.50: 703-720.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	12.6	NA	NR	ug/L	LAB	1984. Lowe-Jinde, L., and A.J. Niimi. Short-Term and Long-Term Effects of Cadmium on Glycogen Reserves and Liver Size in Rainbow Trout (Salmo gairdneri Richardson). Arch. Environ. Contam. Toxicol.13(6): 759-764.
Cadmium chloride (CdCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.97	NA	NR	umol/L	LAB	1994. Zia, S., and D.G. McDonald. Role of the Gills and Gill Chloride Cells in Metal Uptake in the Freshwater-Adapted Rainbow Trout, Oncorhynchus mykiss. Can. J. Fish. Aquat. Sci.51(11): 2482-2492.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	0.62		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	1.09		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	2.96		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	5.54		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	L	0.26		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	L	0.28		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	L	3.18		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.55		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.02		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.48		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	8.2		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	0.95		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	2.18		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	5.3		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	L	0.14		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	L	4.02		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.02		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.48		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.76		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	12.4		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	8.2		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	8.36		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.38	NR	NR	ug/L	LAB	1975. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-10, Jan 1-Dec 31, 1974, Colorado: 29 p..
Nitric acid, Cadmium salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	531	NR	NR	nmol/L	LAB	2004. Niyogi, S., P. Couture, G. Pyle, D.G. McDonald, and C.M. Wood. Acute Cadmium Biotic Ligand Model Characteristics of Laboratory-Reared and Wild Yellow Perch (Perca flavescens) Relative to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.61(6): 942-953.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Reproduction	NR	Multiple Tissue/Orga	T	NR	NA	NR	ug/L	LAB	1994. Brown, V., D. Shurben, W. Miller, and M. Crane. Cadmium Toxicity to Rainbow Trout Oncorhynchus mykiss Walbaum and Brown Trout Salmo trutta L. over Extended Exposure Periods. Ecotoxicol. Environ. Saf.29: 38-46.
Sulfuric acid, Cadmium salt (1:1)	Rainbow Trout	Fish	Fresh	Reproduction	NR	Multiple Tissue/Orga	T	5.48	NA	NR	ug/L	LAB	1994. Brown, V., D. Shurben, W. Miller, and M. Crane. Cadmium Toxicity to Rainbow Trout Oncorhynchus mykiss Walbaum and Brown Trout Salmo trutta L. over Extended Exposure Periods. Ecotoxicol. Environ. Saf.29: 38-46.
Cadmium chloride (CdCl2)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	139	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Cadmium chloride (CdCl2)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Cadmium	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	1720	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Cadmium	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Cadmium	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Cadmium	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1993. Sarkar, S.K.. Role of Cadmium Chloride on Fish and Aquatic Ecosystem. ASFA 1988-1996 CDROM, Prepared by SilverPlatter Information Inc. , Updated 1996:AN 2985087 (ABS) / Fish. Chimes12(12): 20 - 21, 23.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	1212	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	16160	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	1880	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	201	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	21320	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	224	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	244	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	25552	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	3100	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	40203	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	42339	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	45024	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	5032	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	620	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	7175	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	9943	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	175000	NA	NR	ug/L	LAB	1980. Das, K.K., and S.K. Banerjee. Cadmium Toxicity in Fishes. Hydrobiologia75(2): 117-122.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1993. Sarkar, S.K.. Role of Cadmium Chloride on Fish and Aquatic Ecosystem. ASFA 1988-1996 CDROM, Prepared by SilverPlatter Information Inc. , Updated 1996:AN 2985087 (ABS) / Fish. Chimes12(12): 20 - 21, 23.
Cadmium chloride (CdCl2)	Rohu	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1993. Sarkar, S.K.. Role of Cadmium Chloride on Fish and Aquatic Ecosystem. ASFA 1988-1996 CDROM, Prepared by SilverPlatter Information Inc. , Updated 1996:AN 2985087 (ABS) / Fish. Chimes12(12): 20 - 21, 23.
Cadmium chloride (CdCl2)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	7800*	NA	NR	ug/L	LAB	1988. Gill, T.S., J.C. Pant, and H. Tewari. Branchial Pathogenesis in a Freshwater Fish, Puntius conchonius Ham., Chronically Exposed to Sublethal Concentrations of Cadmium. Ecotoxicol. Environ. Saf.15(2): 153-161.
Cadmium	Silver Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	43000	NR	NR	ug/L	LAB	1996. Dutta, T.K., and A. Kaviraj. Effects of Lime Acclimation on the Susceptibility of Two Freshwater Teleosts and One Oligochaete Worm to Metallic Pollutant Cadmium. Folia Biol.44(3-4): 143-148.
Sulfuric acid, Cadmium salt (1:1)	Silver Carp	Fish	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.
Sulfuric acid, Cadmium salt (1:1)	Silver Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2500	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Snake-Head Catfish	Fish	Fresh	Growth	NR		T	3500	NA	NR	ug/L	LAB	1988. Shukla, J.P., and K. Pandey. Toxicity and Long Term Effects of a Sublethal Concentration of Cadmium on the Growth of the Fingerlings of Ophiocephalus punctatus (Bl.). Acta Hydrochim. Hydrobiol.16(5): 537-540.
Cadmium	Snake-Head Catfish	Fish	Fresh	Growth	NR		T	5000	NA	NR	ug/L	NR	1987. Jana, S.R., and N. Bandyopadhyaya. Effect of Heavy Metals on Some Biochemical Parameters in the Freshwater Fish Channa punctatus. Aquat. Sci. Fish. Abstr.18(4): 5486-1Q18.
Cadmium	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	34640	NA	NR	ug/L	LAB	1988. Shukla, J.P., and K. Pandey. Toxicity and Long Term Effects of a Sublethal Concentration of Cadmium on the Growth of the Fingerlings of Ophiocephalus punctatus (Bl.). Acta Hydrochim. Hydrobiol.16(5): 537-540.
Cadmium	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	18500	NA	NR	ug/L	LAB	1988. Shukla, J.P., and K. Pandey. Toxicity and Long Term Effects of a Sublethal Concentration of Cadmium on the Growth of the Fingerlings of Ophiocephalus punctatus (Bl.). Acta Hydrochim. Hydrobiol.16(5): 537-540.
Cadmium chloride (CdCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	24400*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Cadmium chloride (CdCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	405000	NA	NR	ug/L	LAB	1991. Mitra, S.. C-Reactive Protein in the Freshwater Teleost, Channa punctatus: Interaction with Xenobiotics. Ph.D.Thesis (Synopsis), Visva-Bharah Univ., Santiniketan, India: 4 p..
Cadmium chloride (CdCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	18700*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Cadmium chloride (CdCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	15200*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Cadmium chloride (CdCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	405000	NA	NR	ug/L	LAB	1994. Dalal, R., and S. Bhattacharya. Effect of Cadmium, Mercury, and Zinc on the Hepatic Microsomal Enzymes of Channa punctatus. Bull. Environ. Contam. Toxicol.52(6): 893-897.
Cadmium chloride (CdCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	12100*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	10020	NA	NR	ug/L	LAB	1988. Gupta, A.K., and V.K. Rajbanshi. Acute Toxicity of Cadmium to Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.16(5): 525-535.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	9540	NA	NR	ug/L	LAB	1988. Gupta, A.K., and V.K. Rajbanshi. Acute Toxicity of Cadmium to Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.16(5): 525-535.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8120	NA	NR	ug/L	LAB	1988. Gupta, A.K., and V.K. Rajbanshi. Acute Toxicity of Cadmium to Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.16(5): 525-535.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8320	NA	NR	ug/L	LAB	1988. Gupta, A.K., and V.K. Rajbanshi. Acute Toxicity of Cadmium to Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.16(5): 525-535.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	7280	NA	NR	ug/L	LAB	1988. Gupta, A.K., and V.K. Rajbanshi. Acute Toxicity of Cadmium to Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.16(5): 525-535.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	7570	NA	NR	ug/L	LAB	1988. Gupta, A.K., and V.K. Rajbanshi. Acute Toxicity of Cadmium to Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.16(5): 525-535.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	16200	NA	NR	ug/L	LAB	1997. Sastry, K.V., S. Sachdeva, and P. Rathee. Chronic Toxic Effects of Cadmium and Copper, and Their Combination on Some Enzymological and Biochemical Parameters in Channa punctatus. J. Environ. Biol.18(3): 291-303.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	6810	NA	NR	ug/L	LAB	1988. Gupta, A.K.. Accumulation of Cadmium in the Fishes Heteropneustes fossilis and Channa punctatus. Environ. Ecol.6(3): 577-580.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	6810	NA	NR	ug/L	LAB	1988. Gupta, A.K., and V.K. Rajbanshi. Acute Toxicity of Cadmium to Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.16(5): 525-535.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	7400	NA	NR	ug/L	LAB	1988. Gupta, A.K., and V.K. Rajbanshi. Acute Toxicity of Cadmium to Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.16(5): 525-535.
Cadmium	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	19400	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Cadmium	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	16290	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Cadmium	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	14600	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Cadmium	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	19490	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Cadmium	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	9497	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	MATC	Not Reported	T	2900	NA	NR	ug/L	LAB	1988. Gupta, A.K., and V.K. Rajbanshi. Acute Toxicity of Cadmium to Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.16(5): 525-535.
Sulfuric acid, Cadmium salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	MATC	Not Reported	T	4700	NA	NR	ug/L	LAB	1988. Gupta, A.K., and V.K. Rajbanshi. Acute Toxicity of Cadmium to Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.16(5): 525-535.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	11200	NA	NR	ug/L	LAB	1994. Sastry, K.V., and V. Shukla. Influence of Protective Agents in the Toxicity of Cadmium to a Freshwater Fish (Channa punctatus). Bull. Environ. Contam. Toxicol.53(5): 711-717.
Cadmium chloride (CdCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Cadmium chloride (CdCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Cadmium chloride (CdCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Cadmium chloride (CdCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	4500	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Cadmium chloride (CdCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Cadmium chloride (CdCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	8	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Cadmium chloride (CdCl2)	Spotted Barbel	Fish	Fresh	Mortality	LOEC	Not Reported	T	NR	NR	NR	uM	LAB	2008. Cho, Y.S., S.Y. Lee, K.Y. Kim, I.C. Bang, D.S. Kim, and Y.K. Nam. Gene Structure and Expression of Metallothionein During Metal Exposures in Hemibarbus mylodon. Ecotoxicol. Environ. Saf.71(1): 125-137.
Cadmium chloride (CdCl2)	Spotted Barbel	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	uM	LAB	2008. Cho, Y.S., S.Y. Lee, K.Y. Kim, I.C. Bang, D.S. Kim, and Y.K. Nam. Gene Structure and Expression of Metallothionein During Metal Exposures in Hemibarbus mylodon. Ecotoxicol. Environ. Saf.71(1): 125-137.
Cadmium	Stone Loach	Fish	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1989. Douben, P.E.T.. Metabolic Rate and Uptake and Loss of Cadmium From Food by the Fish Noemacheilus barbatulus L. (Stone Loach). Environ. Pollut.59(3): 177-202.
Sulfuric acid, Cadmium salt (1:1)	Stone Loach	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NA	NR	ug/L	LAB	1989. Douben, P.E.T.. Uptake and Elimination of Waterborne Cadmium by the Fish Noemacheilus barbatulus L. (Stone Loach). Arch. Environ. Contam. Toxicol.18(4): 576-586.
Sulfuric acid, Cadmium salt (1:1)	Stone Loach	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NA	NR	ug/L	LAB	1989. Douben, P.E.T.. Uptake and Elimination of Waterborne Cadmium by the Fish Noemacheilus barbatulus L. (Stone Loach). Arch. Environ. Contam. Toxicol.18(4): 576-586.
Sulfuric acid, Cadmium salt (1:1)	Stone Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	4500	NA	NR	ug/L	LAB	1975. Solbe, J.F.D., and V.A. Flook. Studies on the Toxicity of Zinc Sulphate and of Cadmium Sulphate to Stone Loach Noemacheilus barbatulus (L.) in Hard Water. J. Fish Biol.7(5): 631-637.
Cadmium	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	1900	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	6	NA	NR	ug/L	LAB	1985. Wright, D.A., M.J. Meteyer, and F.D. Martin. Effect of Calcium on Cadmium Uptake and Toxicity in Larvae and Juveniles of Striped Bass (Morone saxatilis). Bull. Environ. Contam. Toxicol.34(2): 196-204.
Cadmium	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1988. Wright, D.A.. Dose-Related Toxicity of Copper and Cadmium in Striped Bass Larvae from the Chesapeake Bay: Field Considerations. Water Sci. Technol.20(6-7): 39-48.
Cadmium	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium chloride (CdCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Cadmium chloride (CdCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Cadmium chloride (CdCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Cadmium chloride (CdCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Cadmium chloride (CdCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	1	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Cadmium chloride (CdCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Cadmium chloride (CdCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	4	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Cadmium chloride (CdCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	75	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Cadmium chloride (CdCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	1	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Cadmium chloride (CdCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Cadmium	Striped Bass	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Wright, D.A., M.J. Meteyer, and F.D. Martin. Effect of Calcium on Cadmium Uptake and Toxicity in Larvae and Juveniles of Striped Bass (Morone saxatilis). Bull. Environ. Contam. Toxicol.34(2): 196-204.
Cadmium	Striped Bass	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Wright, D.A., M.J. Meteyer, and F.D. Martin. Effect of Calcium on Cadmium Uptake and Toxicity in Larvae and Juveniles of Striped Bass (Morone saxatilis). Bull. Environ. Contam. Toxicol.34(2): 196-204.
Cadmium chloride (CdCl2)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	25820	NA	NR	ug/L	LAB	1994. Chakrabarti, P., M. Ghosal, and D.K. Mandal. Microanatomical and Histopathological Sequels of Cadmium Intoxication on the Olfactory Epithelium of the Fish Mystus vittatus (Bloch). Environ. Ecol.12(3): 540-544.
Cadmium chloride (CdCl2)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	25820	NA	NR	ug/L	LAB	1988. Datta, D.K., and G.M. Sinha. Estimation of Acute Toxicity of Cadmium, a Heavy Metal, in a Carnivorous Freshwater Teleost, Mystus vittatus (Bloch). C. A. Sel. -Environ. Pollut.2: 108-17431N.
Cadmium	Swamp Or White Ricefield Eel	Fish	Fresh	Reproduction	NR	Ovaries	T	3000	NR	NR	ug/L	LAB	1989. Singh, H.. Interaction of Xenobiotics with Reproductive Endocrine Functions in a Protogynous Teleost, Monopterus albus. Mar. Environ. Res.28: 285-289.
Cadmium	Tench	Fish	Fresh	Mortality	NR	Not Reported	T	19000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	40000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	40000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	25000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	20000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cadmium chloride (CdCl2)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	23000	NA	NR	ug/L	LAB	1977. Pascoe, D., and D.L. Mattey. Studies on the Toxicity of Cadmium to the Three-Spined Stickleback (Gasterosteus aculeatus) L.. J. Fish Biol.11(2): 207-215.
Cadmium chloride (CdCl2)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	6500	NA	NR	ug/L	LAB	1977. Pascoe, D., and P. Cram. The Effect of Parasitism on Toxicity of Cadmium to the Three-Spined Stickleback, (Gasterosteus aculeatus) L. J. Fish Biol.10(5): 467-472.
Cadmium	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1983. Woodworth, J., and D. Pascoe. Cadmium Uptake and Distribution in Sticklebacks Related to the Concentration and Method of Exposure. Ecotoxicol. Environ. Saf.7(6): 525-530.
Cadmium	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Woodworth, J., and D. Pascoe. Cadmium Uptake and Distribution in Sticklebacks Related to the Concentration and Method of Exposure. Ecotoxicol. Environ. Saf.7(6): 525-530.
Cadmium chloride (CdCl2)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Pascoe, D., and P. Cram. The Effect of Parasitism on Toxicity of Cadmium to the Three-Spined Stickleback, (Gasterosteus aculeatus) L. J. Fish Biol.10(5): 467-472.
Nitric acid, Cadmium salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Cadmium chloride (CdCl2)	Tilapia	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Woo, P.T.K., Y.M. Sin, and M.K. Wong. The Effects of Short-Term Acute Cadmium Exposure on Blue Tilapia, Oreochromis aureus. Environ. Biol. Fishes37(1): 67-74.
Nitric acid, Cadmium salt	Tilapia	Fish	Fresh	Growth	NR		T	52	NA	NR	ug/L	LAB	1988. Papoutsoglou, S.E., and P.D. Abel. Sublethal Toxicity and Accumulation of Cadmium in Tilapia aurea. Bull. Environ. Contam. Toxicol.41(3): 404-411.
Nitric acid, Cadmium salt	Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	14	NA	NR	ug/L	LAB	1988. Papoutsoglou, S.E., and P.D. Abel. Sublethal Toxicity and Accumulation of Cadmium in Tilapia aurea. Bull. Environ. Contam. Toxicol.41(3): 404-411.
Nitric acid, Cadmium salt	Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	28	NA	NR	ug/L	LAB	1988. Papoutsoglou, S.E., and P.D. Abel. Sublethal Toxicity and Accumulation of Cadmium in Tilapia aurea. Bull. Environ. Contam. Toxicol.41(3): 404-411.
Nitric acid, Cadmium salt	Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	52	NA	NR	ug/L	LAB	1988. Papoutsoglou, S.E., and P.D. Abel. Sublethal Toxicity and Accumulation of Cadmium in Tilapia aurea. Bull. Environ. Contam. Toxicol.41(3): 404-411.
Nitric acid, Cadmium salt	Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	6.8	NA	NR	ug/L	LAB	1988. Papoutsoglou, S.E., and P.D. Abel. Sublethal Toxicity and Accumulation of Cadmium in Tilapia aurea. Bull. Environ. Contam. Toxicol.41(3): 404-411.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NA	NR	ug/L	LAB	1996. Kargin, F.. Elimination of Cadmium from Cd-Contaminated Tilapia zilli in Media Containing EDTA and Freshwater: Changes in Protein Levels. Bull. Environ. Contam. Toxicol.57(2): 211-216.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	500000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	500000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	500000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	500000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	500000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	500000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Cadmium chloride (CdCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	500000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	315*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	264.8*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	208.9*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	180.7*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	LOEC	Testes	T	33	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	LOEC	Testes	T	33	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	LOEC	Testes	T	33	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	LOEC	Testes	T	66	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	66	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	66	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	66	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	66	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	66	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	66	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	66	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	66	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	33	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NR	Testes	T	NR	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NR	Testes	T	NR	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid, Cadmium salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NR	Testes	T	NR	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Cadmium chloride (CdCl2)	Walking Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1989. Jana, S., and S.S. Sahana. Sensitivity of the Freshwater Fishes Clarias batrachus and Anabas testudineus to Heavy Metals. Environ. Ecol.7(2): 265-270.
Cadmium	Walking Catfish	Fish	NR	Mortality	NR-LETH	Not Reported	T	250000	NA	NR	ug/L	LAB	1979. Banerjee, S.K., P.K. Mukhopadhyay, and P.V. Dehadrai. Studies of Environmental Pollutants on Air-Breathing Fish (Clarias batrachus, L.) and Non-Air-Breathing Fish (Tilapia mossambica Peters). In: S.W.Nielsen, G.Magaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 378.
Cadmium chloride (CdCl2)	Walleye	Fish	Fresh	Mortality	NR	Not Reported	T	86.7	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Cadmium chloride (CdCl2)	Walleye	Fish	Fresh	Mortality	NR	Not Reported	T	8.6	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Cadmium chloride (CdCl2)	Walleye	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	24	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Cadmium chloride (CdCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Sulfuric acid, Cadmium salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	7260	NA	NR	ug/L	LAB	1989. Chagnon, N.L., and S.I. Guttman. Differential Survivorship of Allozyme Genotypes in Mosquitofish Populations Exposed to Copper or Cadmium. Environ. Toxicol. Chem.8(4): 319-326.
Nitric acid, Cadmium salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1977. Giesy, J.P.,Jr., G.J. Leversee, and D.R. Williams. Effects of Naturally Occuring Aquatic Organic Fractions of Cadmium Toxicity to Simocephalus serrulatus (Daphnidae) and Gambusia affinis (Poeciliidae). Water Res.11(11): 1013-1020.
Nitric acid, Cadmium salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1977. Giesy, J.P.,Jr., G.J. Leversee, and D.R. Williams. Effects of Naturally Occuring Aquatic Organic Fractions of Cadmium Toxicity to Simocephalus serrulatus (Daphnidae) and Gambusia affinis (Poeciliidae). Water Res.11(11): 1013-1020.
Nitric acid, Cadmium salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1977. Giesy, J.P.,Jr., G.J. Leversee, and D.R. Williams. Effects of Naturally Occuring Aquatic Organic Fractions of Cadmium Toxicity to Simocephalus serrulatus (Daphnidae) and Gambusia affinis (Poeciliidae). Water Res.11(11): 1013-1020.
Nitric acid, Cadmium salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	2600	NA	NR	ug/L	LAB	1977. Giesy, J.P.,Jr., G.J. Leversee, and D.R. Williams. Effects of Naturally Occuring Aquatic Organic Fractions of Cadmium Toxicity to Simocephalus serrulatus (Daphnidae) and Gambusia affinis (Poeciliidae). Water Res.11(11): 1013-1020.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Cadmium salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	900	NA	NR	ug/L	LAB	1977. Giesy, J.P.,Jr., G.J. Leversee, and D.R. Williams. Effects of Naturally Occuring Aquatic Organic Fractions of Cadmium Toxicity to Simocephalus serrulatus (Daphnidae) and Gambusia affinis (Poeciliidae). Water Res.11(11): 1013-1020.
Cadmium	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	6700	NA	NR	ug/L	LAB	1988. Chagnon, N.L., and S.I. Guttman. Differential Survivorship of Allozyme Genotypes in Mosquitofish (Gambusia affinis) Population Exposed to Copper or Cadmium. Ohio J. Sci.88(2): 46.
Cadmium chloride (CdCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1979. Giesy, J.P.,Jr., H.J. Kania, J.W. Bowling, R.L. Knight, S. Mashburn, and S. Clarkin. Fate and Biological Effects of Cadmium Introduced into Channel Microcosms. EPA-600/3-79-039, Savannah River Ecol.Lab., Inst.of Ecol., Univ.of Georgia, Aiken, SC: 157 p..
Cadmium chloride (CdCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Giesy, J.P., and D.H. Smith. Cadmium Partitioning and Related Effects in Parasitized and Non-Parasitized Mosquitofish (Gambusia affinis: Poeciliidae). Int. Assoc. Theor. Appl. Limnol. Proc. /Int. Ver. Theor. Angew. Limnol. Verh.22: 2405-2412.
Cadmium chloride (CdCl2)	White Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	200	NA	NR	ug/L	LAB	1974. Rowe, D.W., and E.J. Massaro. Cadmium Uptake and Time Dependent Alterations in Tissue Levels in the White Catfish Ictalurus catus (Pisces: Ictaluridae). Bull. Environ. Contam. Toxicol.11(3): 244-249.
Cadmium chloride (CdCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	14000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Cadmium chloride (CdCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	23000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Cadmium chloride (CdCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	5200	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Cadmium	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Cadmium chloride (CdCl2)	White Sucker	Fish	Fresh	Growth	NR		T	36	NA	NR	ug/L	LAB	1986. Borgmann, U., and K.M. Ralph. Effects of Cadmium, 2,4-Dichlorophenol, and Pentachlorophenol on Feeding, Growth, and Particle-Size-Conversion Efficiency of White. Arch. Environ. Contam. Toxicol.15(5): 473-480.
Cadmium chloride (CdCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	5350	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Cadmium chloride (CdCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	2120	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Cadmium chloride (CdCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1410	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Cadmium chloride (CdCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1270	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Cadmium chloride (CdCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1110	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Cadmium chloride (CdCl2)	White Sucker	Fish	Fresh	Mortality	NR	Not Reported	T	28.9	NA	NR	ug/L	LAB	1978. Eaton, J.G., J.M. McKim, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Seven Freshwater Fish Species - 1. Cadmium. Bull. Environ. Contam. Toxicol.19: 95-103.
Cadmium chloride (CdCl2)	White Sucker	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	107.2	NA	NR	ug/L	LAB	1978. Eaton, J.G., J.M. McKim, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Seven Freshwater Fish Species - 1. Cadmium. Bull. Environ. Contam. Toxicol.19: 95-103.
Nitric acid, Cadmium salt	Yellow Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	72420	NR	NR	nmol/L	LAB	2004. Niyogi, S., P. Couture, G. Pyle, D.G. McDonald, and C.M. Wood. Acute Cadmium Biotic Ligand Model Characteristics of Laboratory-Reared and Wild Yellow Perch (Perca flavescens) Relative to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.61(6): 942-953.
Nitric acid, Cadmium salt	Yellow Perch	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	113879	NR	NR	nmol/L	LAB	2004. Niyogi, S., P. Couture, G. Pyle, D.G. McDonald, and C.M. Wood. Acute Cadmium Biotic Ligand Model Characteristics of Laboratory-Reared and Wild Yellow Perch (Perca flavescens) Relative to Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.61(6): 942-953.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Growth	NOEC	Whole Organism	T	50		NC	ug/L	LAB	1982. Canton and Slooff. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug/L	LAB	1995. Nebeker et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	670		NC	ug/L	LAB	1995. Nebeker et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	10850	NA	NR	ug/L	LAB	1977. Birge et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LOEC	Not Reported	T	500		NC	ug/L	LAB	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NOEC	Not Reported	T	5000		NC	ug/L	LAB	Muino et al. 1990. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NOEC	Not Reported	T	5000		NC	ug/L	LAB	Canton and Slooff 1982. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium	Zambezi Barbel	Fish	Fresh	Mortality	NR	Not Reported	T	560	NR	NR	ug/L	LAB	Ferrari et al. 1993. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	Khangarot and Ray 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium	Zambezi Barbel	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	560	NR	NR	ug/L	LAB	Lefcort et al. 1998. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium	Zambezi Barbel	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	560	NR	NR	ug/L	LAB	Richard 1993. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5000		NC	ug/L	LAB	Ferrari et al. 1993. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	LOEC	Sperm	T	25000	NR	NR	ug/L	LAB	Vaal et al. 1997. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	25000	NR	NR	ug/L	LAB	Vaal et al. 1997. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	25000	NR	NR	ug/L	LAB	Sloof and Baerselman 1980, Sloof et al. 1983. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Growth	NOEC	Whole Organism	T	50		NC	ug/L	LAB	Sloof and Baerselman 1980. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Growth	NR		T	10	NA	NR	ug/L	LAB	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Growth	NR		T	50	NA	NR	ug/L	LAB	Muino et al. 1990. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	EC0	Not Reported	T	800	NR	NR	ug/L	LAB	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	EC50	Not Reported	T	5500	NR	NR	ug/L	LAB	Ferrari et al. 1993. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	214.5	NR	NR	uM	LAB	Canton and Slooff 1982. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	100		NC	ug/L	LAB	de Zwart and Sloof 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	Sloof and Baerselman 1980. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	7300	NA	NR	ug/L	LAB	Sloof et al. 1983. . As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	4200	NA	NR	ug/L	LAB	Lefcort et al. 1998. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	de Zwart and Sloof 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	Sloof and Baerselman 1980. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	5400	NA	NR	ug/L	LAB	Ferrari et al. 1993. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	3300	NA	NR	ug/L	LAB	Mudgall and Patil, 1985. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Sulfuric acid, Cadmium salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	Mudgall and Patil, 1985. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Sulfuric acid, Cadmium salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	Muino et al. 1990. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Cadmium salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	48930	NA	NR	ug/L	LAB	Ferrari et al. 1993. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Cadmium salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	21080	NA	NR	ug/L	LAB	Ferrari et al. 1993. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Cadmium salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	8990	NA	NR	ug/L	LAB	Mudgall and Patil, 1985. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Cadmium salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	5420	NA	NR	ug/L	LAB	Mudgall and Patil, 1985. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Cadmium salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	4350	NA	NR	ug/L	LAB	Nebeker et al. 1994. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	Linder et al. 1991. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	150		NC	ug/L	LAB	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	NOEL	Not Reported	T	1500		NC	ug/L	LAB	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	NOEL	Not Reported	T	1500		NC	ug/L	LAB	Munio et al. 1990. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	50000	NR	NR	ug/L	LAB	Ferrari et al. 1993. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	50000	NR	NR	ug/L	LAB	Zettergren et al. 1991. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

Table C-7. Summary of Results from the EcoTox Database for Fish - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	50000	NR	NR	ug/L	LAB	Zettergren et al. 1991. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	50000	NR	NR	ug/L	LAB	Ferrari et al. 1993. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Cadmium chloride (CdCl2)	Zebra Danio	Fish	Fresh	Reproduction	NR		T	1	NA	NR	ug/L	LAB	Khangarot and Ray 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

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Table C-8. Summary of Results from the EcoTox Database for Fish - Cesium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cesium chloride	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	181000	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chlordane	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	A	9731	NA	NR	ug/L	LAB	1994. Gupta, A.K., D. Dutt, M. Anand, and R.C. Dalela. Combined Toxicity of Chlordane, Malathion and Furadan to a Test Fish Notopterus notopterus (Mor). J. Environ. Biol.15(1): 1-6.
Chlordane	Bluegill	Fish	Fresh	Growth	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Bluegill	Fish	Fresh	Growth	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	58	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	145	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	167	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	170	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	27	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	49.8	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	52	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	49	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	22	NR	NR	ug/L	LAB	1974. Mayer, F.L.,Jr.. Pesticides as Pollutants. In: B.G.Liptak (Ed.), Environmental Engineer's Handbook, Chilton Book Co., Radnor, PA: 405-418.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	40	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	128	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	19.1	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	23.4	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	29.3	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	57	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	92	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	56	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	92	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
alpha Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	28.3	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
alpha Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	7.09	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
alpha Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	7.4	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
trans-Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	210	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
trans-Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	50.5	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
trans-Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	59	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	170	NA	NR	ug/L	LAB	1969. Macek, K.J., C. Hutchinson, and O.B. Cope. The Effects of Temperature on the Susceptibility of Bluegills and Rainbow Trout to Selected Pesticides. Bull. Environ. Contam. Toxicol.4(3): 174-183.
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	220	NA	NR	ug/L	LAB	1969. Macek, K.J., C. Hutchinson, and O.B. Cope. The Effects of Temperature on the Susceptibility of Bluegills and Rainbow Trout to Selected Pesticides. Bull. Environ. Contam. Toxicol.4(3): 174-183.
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	95	NA	NR	ug/L	LAB	1969. Macek, K.J., C. Hutchinson, and O.B. Cope. The Effects of Temperature on the Susceptibility of Bluegills and Rainbow Trout to Selected Pesticides. Bull. Environ. Contam. Toxicol.4(3): 174-183.
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	121	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	77	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	59	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	41	NA	NR	ug/L	LAB	1979. Randall, W.F., W.H. Dennis, and M.C. Warner. Acute Toxicity of Dechlorinated DDT, Chlordane and Lindane to Bluegill (Lepomis macrochirus) and Daphnia magna. Bull. Environ. Contam. Toxicol.21(6): 849-854.
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	77	NA	NR	ug/L	LAB	1969. Macek, K.J., C. Hutchinson, and O.B. Cope. The Effects of Temperature on the Susceptibility of Bluegills and Rainbow Trout to Selected Pesticides. Bull. Environ. Contam. Toxicol.4(3): 174-183.
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	77	NA	NR	ug/L	LAB	1969. Macek, K.J., C. Hutchinson, and O.B. Cope. The Effects of Temperature on the Susceptibility of Bluegills and Rainbow Trout to Selected Pesticides. Bull. Environ. Contam. Toxicol.4(3): 174-183.
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	85	NA	NR	ug/L	LAB	1969. Macek, K.J., C. Hutchinson, and O.B. Cope. The Effects of Temperature on the Susceptibility of Bluegills and Rainbow Trout to Selected Pesticides. Bull. Environ. Contam. Toxicol.4(3): 174-183.
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	22	NA	NR	ug/L	LAB	1960. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. The Toxicity of Organic Phosphorus and Chlorinated Hydrocarbon Insecticides to Fish. In: C.M.Tarzwell (Ed.), Biological Problems in Water Pollution, Trans.2nd Seminar, April 20-24,1959, Tech.Rep.W60-3, U.S.Public Health Service, R.A.Taft Sanitary Engineering Center, Cincinnati, OH: 76-88.

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	38	NA	NR	ug/L	LAB	1960. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. The Toxicity of Organic Phosphorus and Chlorinated Hydrocarbon Insecticides to Fish. In: C.M.Tarzwell (Ed.), Biological Problems in Water Pollution, Trans.2nd Seminar, April 20-24,1959, Tech.Rep.W60-3, U.S.Public Health Service, R.A.Taft Sanitary Engineering Center, Cincinnati, OH: 76-88.
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	45	NA	NR	ug/L	LAB	1960. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. The Toxicity of Organic Phosphorus and Chlorinated Hydrocarbon Insecticides to Fish. In: C.M.Tarzwell (Ed.), Biological Problems in Water Pollution, Trans.2nd Seminar, April 20-24,1959, Tech.Rep.W60-3, U.S.Public Health Service, R.A.Taft Sanitary Engineering Center, Cincinnati, OH: 76-88.
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	62	NA	NR	ug/L	LAB	1979. Randall, W.F., W.H. Dennis, and M.C. Warner. Acute Toxicity of Dechlorinated DDT, Chlordane and Lindane to Bluegill (Lepomis macrochirus) and Daphnia magna. Bull. Environ. Contam. Toxicol.21(6): 849-854.
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	46	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	40	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	F	36	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	F	32	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	F	22	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
Chlordane	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Bluegill	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	200	NA	NR	ug/L	LAB	1950. Lawrence, J.M.. Toxicity of Some New Insecticides to Several Species of Pondfish. Prog. Fish-Cult.12: 141-150.
Chlordane	Bluegill	Fish	Fresh	Reproduction	NR	Gonad(s)	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Bluegill	Fish	Fresh	Reproduction	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	125	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	117	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	102	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	47	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	39	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	31	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	25	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chlordane	Brook Trout	Fish	Fresh	Reproduction	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	38	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	30.4	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	11.1	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	11.1	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Carp	Fish	Fresh	Mortality	LC50	Not Reported	F	40	NA	NR	ug/L	LAB	1988. Ravikumar, S.S., and T.R.C. Gupta. Toxicity of Chlordane and Malathion to Silver Carp and Common Carp. In: M.Mohan Joseph (Ed.), Proceedings of the First Indian Fisheries Forum, Asian Fisheries Society, Indian Branch, Mangalore: 281-283.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Carp	Fish	Fresh	Mortality	LC50	Not Reported	F	70	NA	NR	ug/L	LAB	1988. Ravikumar, S.S., and T.R.C. Gupta. Toxicity of Chlordane and Malathion to Silver Carp and Common Carp. In: M.Mohan Joseph (Ed.), Proceedings of the First Indian Fisheries Forum, Asian Fisheries Society, Indian Branch, Mangalore: 281-283.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	80	NA	NR	ug/L	LAB	1988. Ravikumar, S.S., and T.R.C. Gupta. Toxicity of Chlordane and Malathion to Silver Carp and Common Carp. In: M.Mohan Joseph (Ed.), Proceedings of the First Indian Fisheries Forum, Asian Fisheries Society, Indian Branch, Mangalore: 281-283.
Chlordane	Carp, Hawk Fish	Fish	Fresh	Growth	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1986. Ravikumar, S.S.. Effects of Pesticides on the Cultivable Carps. Mysore J. Agric. Sci.20(1): 88.
Chlordane	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	A	14	NA	NR	ug/L	LAB	1984. Verma, S.R., I.P. Tonk, A.K. Gupta, and M. Saxena. Evaluation of an Application Factor for Determining the Safe Concentration of Agricultural and Industrial Chemicals. Water Res.18(1): 111-115.
Chlordane	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	F	15	NA	NR	ug/L	LAB	1980. Bansal, S.K., S.R. Verma, A.K. Gupta, and R.C. Dalela. Predicting Long-Term Toxicity by Subacute Screening of Pesticides with Larvae and Early Juveniles of Four Species of Freshwater Major Carp. Ecotoxicol. Environ. Saf.4: 224-231.
Chlordane	Carp, Hawk Fish	Fish	Fresh	Mortality	MATC	Not Reported	A	NR	NA	NR	ug/L	LAB	1984. Verma, S.R., I.P. Tonk, A.K. Gupta, and M. Saxena. Evaluation of an Application Factor for Determining the Safe Concentration of Agricultural and Industrial Chemicals. Water Res.18(1): 111-115.
Chlordane	Carp, Hawk Fish	Fish	Fresh	Mortality	MATC	Not Reported	F	NR	NA	NR	ug/L	LAB	1980. Bansal, S.K., S.R. Verma, A.K. Gupta, and R.C. Dalela. Predicting Long-Term Toxicity by Subacute Screening of Pesticides with Larvae and Early Juveniles of Four Species of Freshwater Major Carp. Ecotoxicol. Environ. Saf.4: 224-231.
Chlordane	Catla	Fish	Fresh	Mortality	LC50	Not Reported	F	12	NA	NR	ug/L	LAB	1980. Bansal, S.K., S.R. Verma, A.K. Gupta, and R.C. Dalela. Predicting Long-Term Toxicity by Subacute Screening of Pesticides with Larvae and Early Juveniles of Four Species of Freshwater Major Carp. Ecotoxicol. Environ. Saf.4: 224-231.
Chlordane	Catla	Fish	Fresh	Mortality	MATC	Not Reported	F	NR	NA	NR	ug/L	LAB	1980. Bansal, S.K., S.R. Verma, A.K. Gupta, and R.C. Dalela. Predicting Long-Term Toxicity by Subacute Screening of Pesticides with Larvae and Early Juveniles of Four Species of Freshwater Major Carp. Ecotoxicol. Environ. Saf.4: 224-231.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	1.6	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	194	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	260	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	28	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	370	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	47.3	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	0.8	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	225	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	230	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	45.8	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	6.7	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	70	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LD50	Not Reported	A	2000	NA	NR	ug/L	LAB	1959. Clemens, H.P., and K.E. Sneed. Lethal Doses of Several Commercial Chemicals for Fingerling Channel Catfish. U.S.Fish.Wildl.Serv., Spec.Sci.Rep.- Fish No.316, Washington, DC: 10 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LD50	Not Reported	A	2000	NA	NR	ug/L	LAB	1959. Clemens, H.P., and K.E. Sneed. Lethal Doses of Several Commercial Chemicals for Fingerling Channel Catfish. U.S.Fish.Wildl.Serv., Spec.Sci.Rep.- Fish No.316, Washington, DC: 10 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LD50	Not Reported	A	1330	NA	NR	ug/L	LAB	1959. Clemens, H.P., and K.E. Sneed. Lethal Doses of Several Commercial Chemicals for Fingerling Channel Catfish. U.S.Fish.Wildl.Serv., Spec.Sci.Rep.- Fish No.316, Washington, DC: 10 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LD50	Not Reported	A	740	NA	NR	ug/L	LAB	1959. Clemens, H.P., and K.E. Sneed. Lethal Doses of Several Commercial Chemicals for Fingerling Channel Catfish. U.S.Fish.Wildl.Serv., Spec.Sci.Rep.- Fish No.316, Washington, DC: 10 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LD50	Not Reported	A	500	NA	NR	ug/L	LAB	1959. Clemens, H.P., and K.E. Sneed. Lethal Doses of Several Commercial Chemicals for Fingerling Channel Catfish. U.S.Fish.Wildl.Serv., Spec.Sci.Rep.- Fish No.316, Washington, DC: 10 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LD50	Not Reported	A	500	NA	NR	ug/L	LAB	1959. Clemens, H.P., and K.E. Sneed. Lethal Doses of Several Commercial Chemicals for Fingerling Channel Catfish. U.S.Fish.Wildl.Serv., Spec.Sci.Rep.- Fish No.316, Washington, DC: 10 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Channel Catfish	Fish	Fresh	Mortality	LD50	Not Reported	A	500	NA	NR	ug/L	LAB	1959. Clemens, H.P., and K.E. Sneed. Lethal Doses of Several Commercial Chemicals for Fingerling Channel Catfish. U.S.Fish.Wildl.Serv., Spec.Sci.Rep.- Fish No.316, Washington, DC: 10 p..

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	A	59	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	A	59	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	A	57	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	A	57	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
2,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Chlordane	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	A	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	F	151	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	F	155	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	F	19.7	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	A	100	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	A	86	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	A	82	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	F	13.9	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	F	14	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	F	16.3	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	F	73.5	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	F	80	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	A	56	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
2,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Chlordane	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	A	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Chlordane	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	A	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	F	1160	NA	NR	ug/L	LAB	1960. Ludemann, D., and H. Neumann. Acute Toxicity of Modern Contact Insecticides to Carp (Vesuche uber die AkuteToxische Wirkung Neuzeitlicher Kontaktinsektizide auf Einsommerige Karpfen(Cyprinus carpio L.)). Z. Angew. Zool.47: 11-33.
Chlordane	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	4.6	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Chlordane	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	3.65	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Chlordane	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	2.9	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Chlordane	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	16	NA	NR	ug/L	LAB	1981. Verma, S.R., I.P. Tonk, and R.C. Dalela. Determination of the Maximum Acceptable Toxicant Concentration (MATC) and the Safe Concentration for Certain Aquatic Pollutants. Acta Hydrochim. Hydrobiol.9(3): 247-254.
Chlordane	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	F	16	NA	NR	ug/L	LAB	1980. Bansal, S.K., S.R. Verma, A.K. Gupta, and R.C. Dalela. Predicting Long-Term Toxicity by Subacute Screening of Pesticides with Larvae and Early Juveniles of Four Species of Freshwater Major Carp. Ecotoxicol. Environ. Saf.4: 224-231.
Chlordane	Common Carp	Fish	Fresh	Mortality	MATC	Not Reported	F	NR	NA	NR	ug/L	LAB	1980. Bansal, S.K., S.R. Verma, A.K. Gupta, and R.C. Dalela. Predicting Long-Term Toxicity by Subacute Screening of Pesticides with Larvae and Early Juveniles of Four Species of Freshwater Major Carp. Ecotoxicol. Environ. Saf.4: 224-231.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	A	5000	NA	NR	ug/L	LAB	1970. Malone, C.R., and B.G. Blaylock. Toxicity of Insecticide Formulations to Carp Embryos Reared In Vitro. J. Wildl. Manag.34(2): 460-463.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	A	1000	NA	NR	ug/L	LAB	1970. Malone, C.R., and B.G. Blaylock. Toxicity of Insecticide Formulations to Carp Embryos Reared In Vitro. J. Wildl. Manag.34(2): 460-463.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	101000	NA	NR	ug/L	LAB	1963. Loeb, H.A., and W.H. Kelly. Acute Oral Toxicity of 1,496 Chemicals Force-Fed to Carp. U.S.Fish.Wildl.Serv., Sp.Sci.Rep.-Fish.No.471, Washington, D.C.: 124 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	NR	NA	NR	ug/L	LAB	1963. Loeb, H.A., and W.H. Kelly. Acute Oral Toxicity of 1,496 Chemicals Force-Fed to Carp. U.S.Fish.Wildl.Serv., Sp.Sci.Rep.-Fish.No.471, Washington, D.C.: 124 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	NR	NA	NR	ug/L	LAB	1963. Loeb, H.A., and W.H. Kelly. Acute Oral Toxicity of 1,496 Chemicals Force-Fed to Carp. U.S.Fish.Wildl.Serv., Sp.Sci.Rep.-Fish.No.471, Washington, D.C.: 124 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	NR	NA	NR	ug/L	LAB	1963. Loeb, H.A., and W.H. Kelly. Acute Oral Toxicity of 1,496 Chemicals Force-Fed to Carp. U.S.Fish.Wildl.Serv., Sp.Sci.Rep.-Fish.No.471, Washington, D.C.: 124 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	43	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	48	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	23	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	27	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Chlordane	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	A	6.03	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	A	2.78	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	320	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	420	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	80.7	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	21.4	NR	NR	ug/L	LAB	1998. Moore, M.T., D.B. Huggett, W.B.,Jr. Gillespie, J.H.,Jr. Rodgers, and C.M. Cooper. Comparative Toxicity of Chlordane, Chlorpyrifos, and Aldicarb to Four Aquatic Testing Organisms. Arch. Environ. Contam. Toxicol.34(2): 152-157.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	52	NR	NR	ug/L	LAB	1974. Mayer, F.L.,Jr.. Pesticides as Pollutants. In: B.G.Liptak (Ed.), Environmental Engineer's Handbook, Chilton Book Co., Radnor, PA: 405-418.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	115	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	24.8	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	56	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Chlordane	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	53.4	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chlordane	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	41.7	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	36.9	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	35.9	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	33.9	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	32.1	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
2,3,4,5,6,6a,7,7-Octachloro-1a,1b,5,5a,6,6a-hexahydro-2,5-methano-2H-indeno[1,2-b]oxlrene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	2.45	NA	NR	ug/L	LAB	1991. Brooke, L.T.. Results of Freshwater Exposures with the Chemicals Atrazine, Biphenyl, Butachlor, Carbaryl, Carbazole, Dibenzofuran, 3,3'-Dichlorobenzidine, Dichlorvos, 1,2-Epoxyethylbenzene (Styrene Oxide), Isophorone, Isopropalin, Oxy. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 110 p..
2,3,4,5,6,6a,7,7-Octachloro-1a,1b,5,5a,6,6a-hexahydro-2,5-methano-2H-indeno[1,2-b]oxlrene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	2.63	NA	NR	ug/L	LAB	1991. Brooke, L.T.. Results of Freshwater Exposures with the Chemicals Atrazine, Biphenyl, Butachlor, Carbaryl, Carbazole, Dibenzofuran, 3,3'-Dichlorobenzidine, Dichlorvos, 1,2-Epoxyethylbenzene (Styrene Oxide), Isophorone, Isopropalin, Oxy. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 110 p..
2,3,4,5,6,6a,7,7-Octachloro-1a,1b,5,5a,6,6a-hexahydro-2,5-methano-2H-indeno[1,2-b]oxlrene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	6.32	NA	NR	ug/L	LAB	1991. Brooke, L.T.. Results of Freshwater Exposures with the Chemicals Atrazine, Biphenyl, Butachlor, Carbaryl, Carbazole, Dibenzofuran, 3,3'-Dichlorobenzidine, Dichlorvos, 1,2-Epoxyethylbenzene (Styrene Oxide), Isophorone, Isopropalin, Oxy. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 110 p..
2,3,4,5,6,6a,7,7-Octachloro-1a,1b,5,5a,6,6a-hexahydro-2,5-methano-2H-indeno[1,2-b]oxlrene	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	4.31	NA	NR	ug/L	LAB	1991. Brooke, L.T.. Results of Freshwater Exposures with the Chemicals Atrazine, Biphenyl, Butachlor, Carbaryl, Carbazole, Dibenzofuran, 3,3'-Dichlorobenzidine, Dichlorvos, 1,2-Epoxyethylbenzene (Styrene Oxide), Isophorone, Isopropalin, Oxy. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 110 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	190	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	260	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	69	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	98	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	170	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	180	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	69	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	69	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	52	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	69	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	170	A	127	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	F	180	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	A	25	NR	NR	ug/L	LAB	1998. Moore, M.T., D.B. Huggett, W.B.,Jr. Gillespie, J.H.,Jr. Rodgers, and C.M. Cooper. Comparative Toxicity of Chlordane, Chlorpyrifos, and Aldicarb to Four Aquatic Testing Organisms. Arch. Environ. Contam. Toxicol.34(2): 152-157.
Chlordane	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Fathead Minnow	Fish	Fresh	Reproduction	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1977. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute and Chronic Toxicity of Chlordane to Fish and Invertebrates. EPA-600/3-77-019, U.S.EPA, Duluth, MN: 126 p..
Chlordane	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	F	2325	NA	NR	ug/L	LAB	1970. Minchew, C.D., and D.E. Ferguson. Toxicities of Six Insecticides to Resistant and Susceptible Green Sunfish and Golden Shiners in Static Bioassays. J. Miss. Acad. Sci.15: 29-32.
Chlordane	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	F	405	NA	NR	ug/L	LAB	1970. Minchew, C.D., and D.E. Ferguson. Toxicities of Six Insecticides to Resistant and Susceptible Green Sunfish and Golden Shiners in Static Bioassays. J. Miss. Acad. Sci.15: 29-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	F	166	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	F	87	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	F	82	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	F	50	NA	NR	ug/L	LAB	1947. Ginsburg, J.M.. Tests with New Toxicants, in Comparison with DDT, on Mosquito Larvae and Fish. Proc. N. J. Mosq. Exterm. Assoc.34: 132-135.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	125	NA	NR	ug/L	LAB	1947. Ginsburg, J.M.. Tests with New Toxicants, in Comparison with DDT, on Mosquito Larvae and Fish. Proc. N. J. Mosq. Exterm. Assoc.34: 132-135.
Chlordane	Green Sunfish	Fish	Fresh	Mortality	LC50	Not Reported	F	3275	NA	NR	ug/L	LAB	1970. Minchew, C.D., and D.E. Ferguson. Toxicities of Six Insecticides to Resistant and Susceptible Green Sunfish and Golden Shiners in Static Bioassays. J. Miss. Acad. Sci.15: 29-32.
Chlordane	Green Sunfish	Fish	Fresh	Mortality	LC50	Not Reported	F	86	NA	NR	ug/L	LAB	1970. Minchew, C.D., and D.E. Ferguson. Toxicities of Six Insecticides to Resistant and Susceptible Green Sunfish and Golden Shiners in Static Bioassays. J. Miss. Acad. Sci.15: 29-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	F	1500	NA	NR	ug/L	LAB	1984. Gupta, P.K., V.S. Mujumdar, and P.S. Rao. Studies on the Toxicity of Some Insecticides to a Freshwater Teleost Lebistes reticulatus. Acta Hydrochim. Hydrobiol.12(6): 629-636.

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1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	F	1173	NA	NR	ug/L	LAB	1984. Gupta, P.K., V.S. Mujumdar, and P.S. Rao. Studies on the Toxicity of Some Insecticides to a Freshwater Teleost Lebistes reticulatus. Acta Hydrochim. Hydrobiol.12(6): 629-636.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	F	870	NA	NR	ug/L	LAB	1984. Gupta, P.K., V.S. Mujumdar, and P.S. Rao. Studies on the Toxicity of Some Insecticides to a Freshwater Teleost Lebistes reticulatus. Acta Hydrochim. Hydrobiol.12(6): 629-636.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	F	590	NA	NR	ug/L	LAB	1984. Gupta, P.K., V.S. Mujumdar, and P.S. Rao. Studies on the Toxicity of Some Insecticides to a Freshwater Teleost Lebistes reticulatus. Acta Hydrochim. Hydrobiol.12(6): 629-636.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	F	341	NA	NR	ug/L	LAB	1984. Gupta, P.K., V.S. Mujumdar, and P.S. Rao. Studies on the Toxicity of Some Insecticides to a Freshwater Teleost Lebistes reticulatus. Acta Hydrochim. Hydrobiol.12(6): 629-636.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	F	560	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	F	190	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	F	190	NA	NR	ug/L	LAB	1959. Henderson, C., Q.H. Pickering, and C.M. Tarzwell. Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish. Trans. Am. Fish. Soc.88(1): 23-32.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	540	NA	NR	ug/L	LAB	1978. Verma, S.R., S.K. Bansal, and R.C. Dalela. Toxicity of Selected Organic Pesticides to a Fresh Water Teleost Fish, Saccrobranchus fossilis and Its Application in Controlling Water Pollution. Arch. Environ. Contam. Toxicol.7(3): 317-323.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	3500	NA	NR	ug/L	LAB	1984. Mishra, J., and A.K. Srivastava. Effects of Chlordane on the Blood and Tissue Chemistry of a Teleost Fish, Heteropneustes fossilis. Cell. Mol. Biol.30(6): 519-523.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	560	NA	NR	ug/L	LAB	1982. Verma, S.R., S.K. Bansal, A.K. Gupta, N. Pal, A.K. Tyagi, M.C. Bhatnagar, V. Kumar, and R.C. Dalela. Bioassay Trials with Twenty-Three Pesticides to a Fresh Water Teleost, Saccobranchus fossilis. Water Res.16(5): 525-529.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	490	NA	NR	ug/L	LAB	1978. Verma, S.R., S.K. Bansal, and R.C. Dalela. Toxicity of Selected Organic Pesticides to a Fresh Water Teleost Fish, Saccrobranchus fossilis and Its Application in Controlling Water Pollution. Arch. Environ. Contam. Toxicol.7(3): 317-323.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	1250	NA	NR	ug/L	LAB	1984. Mishra, J., and A.K. Srivastava. Effects of Chlordane on the Blood and Tissue Chemistry of a Teleost Fish, Heteropneustes fossilis. Cell. Mol. Biol.30(6): 519-523.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	480	NA	NR	ug/L	LAB	1982. Verma, S.R., S.K. Bansal, A.K. Gupta, N. Pal, A.K. Tyagi, M.C. Bhatnagar, V. Kumar, and R.C. Dalela. Bioassay Trials with Twenty-Three Pesticides to a Fresh Water Teleost, Saccobranchus fossilis. Water Res.16(5): 525-529.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	450	NA	NR	ug/L	LAB	1978. Verma, S.R., S.K. Bansal, and R.C. Dalela. Toxicity of Selected Organic Pesticides to a Fresh Water Teleost Fish, Saccrobranchus fossilis and Its Application in Controlling Water Pollution. Arch. Environ. Contam. Toxicol.7(3): 317-323.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	290	NA	NR	ug/L	LAB	1984. Mishra, J., and A.K. Srivastava. Effects of Chlordane on the Blood and Tissue Chemistry of a Teleost Fish, Heteropneustes fossilis. Cell. Mol. Biol.30(6): 519-523.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	450	NA	NR	ug/L	LAB	1982. Verma, S.R., S.K. Bansal, A.K. Gupta, N. Pal, A.K. Tyagi, M.C. Bhatnagar, V. Kumar, and R.C. Dalela. Bioassay Trials with Twenty-Three Pesticides to a Fresh Water Teleost, Saccobranchus fossilis. Water Res.16(5): 525-529.

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1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	420	NA	NR	ug/L	LAB	1978. Verma, S.R., S.K. Bansal, and R.C. Dalela. Toxicity of Selected Organic Pesticides to a Fresh Water Teleost Fish, Saccrobranchus fossilis and Its Application in Controlling Water Pollution. Arch. Environ. Contam. Toxicol.7(3): 317-323.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	275	NA	NR	ug/L	LAB	1984. Mishra, J., and A.K. Srivastava. Effects of Chlordane on the Blood and Tissue Chemistry of a Teleost Fish, Heteropneustes fossilis. Cell. Mol. Biol.30(6): 519-523.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	420	NA	NR	ug/L	LAB	1982. Verma, S.R., S.K. Bansal, A.K. Gupta, N. Pal, A.K. Tyagi, M.C. Bhatnagar, V. Kumar, and R.C. Dalela. Bioassay Trials with Twenty-Three Pesticides to a Fresh Water Teleost, Saccobranchus fossilis. Water Res.16(5): 525-529.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	14	NA	NR	ug/L	LAB	1993. Rai, U.P., and P.K. Mandal. Effects of Seasonal Ambient Temperature Variations on Acute Toxicity of Chlordane to an Air-Breathing Indian Catfish, Heteropneustes fossilis (Bloch.). Bull. Environ. Contam. Toxicol.51(3): 453-459.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	18	NA	NR	ug/L	LAB	1993. Rai, U.P., and P.K. Mandal. Effects of Seasonal Ambient Temperature Variations on Acute Toxicity of Chlordane to an Air-Breathing Indian Catfish, Heteropneustes fossilis (Bloch.). Bull. Environ. Contam. Toxicol.51(3): 453-459.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	60	NA	NR	ug/L	LAB	1993. Rai, U.P., and P.K. Mandal. Effects of Seasonal Ambient Temperature Variations on Acute Toxicity of Chlordane to an Air-Breathing Indian Catfish, Heteropneustes fossilis (Bloch.). Bull. Environ. Contam. Toxicol.51(3): 453-459.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	70	NA	NR	ug/L	LAB	1993. Rai, U.P., and P.K. Mandal. Effects of Seasonal Ambient Temperature Variations on Acute Toxicity of Chlordane to an Air-Breathing Indian Catfish, Heteropneustes fossilis (Bloch.). Bull. Environ. Contam. Toxicol.51(3): 453-459.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	89	NA	NR	ug/L	LAB	1993. Rai, U.P., and P.K. Mandal. Effects of Seasonal Ambient Temperature Variations on Acute Toxicity of Chlordane to an Air-Breathing Indian Catfish, Heteropneustes fossilis (Bloch.). Bull. Environ. Contam. Toxicol.51(3): 453-459.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Indian Catfish	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1996. Mandal, P.K., and U.P. Rai. Acute Behavioral Responses of an Air-Breathing Catfish Exposed to Two Cyclodiene Insecticides. Environ. Ecol.14(4): 926-930.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	ke Trout, Siscov	Fish	Fresh	Growth	LOEC	Whole Organism	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	ke Trout, Siscov	Fish	Fresh	Growth	NOEC	Whole Organism	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	ke Trout, Siscov	Fish	Fresh	Growth	NOEC	Whole Organism	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	ke Trout, Siscov	Fish	Fresh	Growth	NOEC	Whole Organism	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	ke Trout, Siscov	Fish	Fresh	Mortality	NOEC	Not Reported	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	ke Trout, Siscov	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	ake Trout, Siscov	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Lake Trout, Siscowet	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Lake Trout, Siscowet	Fish	Fresh	Reproduction	NOEC	Embryo	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Lake Trout, Siscowet	Fish	Fresh	Reproduction	NOEC	Embryo	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Lake Trout, Siscowet	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Lake Trout, Siscowet	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	ake Trout, Siscov	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	ake Trout, Siscov	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	ake Trout, Siscov	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	ake Trout, Siscov	Fish	Fresh	Reproduction	NR	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Largemouth Bas	Fish	Fresh	Mortality	LC50	Not Reported	F	180	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Largemouth Bas	Fish	Fresh	Mortality	LC50	Not Reported	F	27	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Largemouth Bas	Fish	Fresh	Mortality	LC50	Not Reported	F	270	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Largemouth Bas	Fish	Fresh	Mortality	LC50	Not Reported	F	320	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	F	94	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	F	12	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	F	130	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	F	140	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	F	32	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	F	56	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Chlordane	Largemouth Bass	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	200	NA	NR	ug/L	LAB	1950. Lawrence, J.M.. Toxicity of Some New Insecticides to Several Species of Pondfish. Prog. Fish-Cult.12: 141-150.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Minnow,Carp Family	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.
Chlordane	Northern Pike	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1961. Ludemann, D., and H. Neumann. Acute Toxicity of Present Contact Insecticides for Freshwater Animals(Versuche uber die Akute Toxische Wirkung Neuzeitlicher Kontaktinsektizide auf Susswassertiere). Z. Angew. Zool.48: 87-96.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	orthern Squawfis	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
2,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	orthern Squawfis	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Chlordane	orthern Squawfis	Fish	Fresh	Mortality	NR	Not Reported	A	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Chlordane	orthern Squawfis	Fish	Fresh	Mortality	NR	Not Reported	A	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Pike Family	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	110	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	12.9	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	145	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	15.4	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	20	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	200	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	27	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	28.1	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	28.6	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	32.6	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	34	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	36.2	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	40	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	40	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	43.6	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	55.6	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	58	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	60	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	61	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	62.4	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	66	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	72.1	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	73	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	74	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	77.7	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	91	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	56	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	44	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	44	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	44	NR	NR	ug/L	LAB	1974. Mayer, F.L.,Jr.. Pesticides as Pollutants. In: B.G.Liptak (Ed.), Environmental Engineer's Handbook, Chilton Book Co., Radnor, PA: 405-418.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	10	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	10.2	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	12.6	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	135	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	19	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	19.5	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	2.9	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	20	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	24.9	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	24.9	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	27	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	28.5	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	29	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	31	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	4.43	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	42	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	45	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	45	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	47	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	59	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	7.11	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	72	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	8.2	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	9.1	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	130	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	9	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	44	NA	NR	ug/L	LAB	1961. Katz, M.. Acute Toxicity of Some Organic Insecticides to Three Species of Salmonids and to the Threespine Stickleback. Trans. Am. Fish. Soc.90(3): 264-268.
Chlordane	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	22	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..
Chlordane	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	10	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..
Chlordane	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	7.8	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	1000	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	500	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	1000	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	250	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	250	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	500	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	500	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	500	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	1000	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	F	4300	NA	NR	ug/L	FIELDN	1949. Cope, O.B., C.M. Gjullin, and A. Storm. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Trans. Am. Fish. Soc.77: 160-177.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	F	1500	NA	NR	ug/L	FIELDN	1949. Cope, O.B., C.M. Gjullin, and A. Storm. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Trans. Am. Fish. Soc.77: 160-177.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	250	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	250	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	250	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	500	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
Chlordane	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1961. Ludemann, D., and H. Neumann. Acute Toxicity of Present Contact Insecticides for Freshwater Animals(Versuche uber die Akute Toxische Wirkung Neuzeitlicher Kontaktinsektizide auf Susswassertiere). Z. Angew. Zool.48: 87-96.
Chlordane	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Chlordane	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	1000	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	1000	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	1000	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	500	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	500	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	250	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	500	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	500	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	250	NA	NR	ug/L	LAB	1955. Mayhew, J.. Toxicity of Seven Different Insecticides to Rainbow Trout Salmo gairdnerii (Richardson). Proc. Iowa Acad. Sci.62: 599-606.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	1000	NA	NR	ug/L	FIELDN	1949. Cope, O.B., C.M. Gjullin, and A. Storm. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Trans. Am. Fish. Soc.77: 160-177.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	4000	NA	NR	ug/L	FIELDN	1949. Cope, O.B., C.M. Gjullin, and A. Storm. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Trans. Am. Fish. Soc.77: 160-177.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	500	NA	NR	ug/L	FIELDN	1949. Cope, O.B., C.M. Gjullin, and A. Storm. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Trans. Am. Fish. Soc.77: 160-177.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	6000	NA	NR	ug/L	FIELDN	1949. Cope, O.B., C.M. Gjullin, and A. Storm. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Trans. Am. Fish. Soc.77: 160-177.
Chlordane	Rohu	Fish	Fresh	Growth	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1986. Ravikumar, S.S.. Effects of Pesticides on the Cultivable Carps. Mysore J. Agric. Sci.20(1): 88.
Chlordane	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	F	210	NA	NR	ug/L	LAB	1977. Verma, S.R., S.K. Bansal, and R.C. Dalela. Bioassay Trials with a Few Organic Biocides on Fresh Water Fish Lobeo rohita. Indian J. Environ. Health19(2): 107-115.
Chlordane	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	F	200	NA	NR	ug/L	LAB	1977. Verma, S.R., S.K. Bansal, and R.C. Dalela. Bioassay Trials with a Few Organic Biocides on Fresh Water Fish Lobeo rohita. Indian J. Environ. Health19(2): 107-115.
Chlordane	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	F	190	NA	NR	ug/L	LAB	1977. Verma, S.R., S.K. Bansal, and R.C. Dalela. Bioassay Trials with a Few Organic Biocides on Fresh Water Fish Lobeo rohita. Indian J. Environ. Health19(2): 107-115.
Chlordane	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	F	180	NA	NR	ug/L	LAB	1977. Verma, S.R., S.K. Bansal, and R.C. Dalela. Bioassay Trials with a Few Organic Biocides on Fresh Water Fish Lobeo rohita. Indian J. Environ. Health19(2): 107-115.
Chlordane	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	F	20	NA	NR	ug/L	LAB	1980. Bansal, S.K., S.R. Verma, A.K. Gupta, and R.C. Dalela. Predicting Long-Term Toxicity by Subacute Screening of Pesticides with Larvae and Early Juveniles of Four Species of Freshwater Major Carp. Ecotoxicol. Environ. Saf.4: 224-231.
Chlordane	Rohu	Fish	Fresh	Mortality	MATC	Not Reported	F	NR	NA	NR	ug/L	LAB	1980. Bansal, S.K., S.R. Verma, A.K. Gupta, and R.C. Dalela. Predicting Long-Term Toxicity by Subacute Screening of Pesticides with Larvae and Early Juveniles of Four Species of Freshwater Major Carp. Ecotoxicol. Environ. Saf.4: 224-231.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Silver Carp	Fish	Fresh	Mortality	LC50	Not Reported	F	45	NA	NR	ug/L	LAB	1988. Ravikumar, S.S., and T.R.C. Gupta. Toxicity of Chlordane and Malathion to Silver Carp and Common Carp. In: M.Mohan Joseph (Ed.), Proceedings of the First Indian Fisheries Forum, Asian Fisheries Society, Indian Branch, Mangalore: 281-283.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Silver Carp	Fish	Fresh	Mortality	LC50	Not Reported	F	40	NA	NR	ug/L	LAB	1988. Ravikumar, S.S., and T.R.C. Gupta. Toxicity of Chlordane and Malathion to Silver Carp and Common Carp. In: M.Mohan Joseph (Ed.), Proceedings of the First Indian Fisheries Forum, Asian Fisheries Society, Indian Branch, Mangalore: 281-283.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Silver Carp	Fish	Fresh	Mortality	LC50	Not Reported	F	25	NA	NR	ug/L	LAB	1988. Ravikumar, S.S., and T.R.C. Gupta. Toxicity of Chlordane and Malathion to Silver Carp and Common Carp. In: M.Mohan Joseph (Ed.), Proceedings of the First Indian Fisheries Forum, Asian Fisheries Society, Indian Branch, Mangalore: 281-283.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Silver Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	50	NA	NR	ug/L	LAB	1988. Ravikumar, S.S., and T.R.C. Gupta. Toxicity of Chlordane and Malathion to Silver Carp and Common Carp. In: M.Mohan Joseph (Ed.), Proceedings of the First Indian Fisheries Forum, Asian Fisheries Society, Indian Branch, Mangalore: 281-283.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Trout Family	Fish	Fresh	Reproduction	NR	Not Reported	F	25000	NA	NR	ug/L	FIELDN	1992. Delorme, P.D.. Reproductive Success of Lake Trout and White Suckers Given Single Injections of Toxaphene, Chlordane or 2,3,4,7,8-Pentachlorodibenzofuran. In: Proc. 35th Conf. Int. Assoc. Great Lakes Res. , May 31-June 4, 1992, Univ. of Waterloo, ONT, Canada: 180.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	F	41	NA	NR	ug/L	LAB	1969. Culley, D.D.,Jr., and D.E. Ferguson. Patterns of Insecticide Resistance in the Mosquitofish, Gambusia affinis. J. Fish. Res. Board Can.26(9): 2395-2401.

Table C-9. Summary of Results from the EcoTox Database for Fish - Chlordane

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chlordane	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	lb/acre	FIELDN	1963. Mulla, M.S.. Toxicity of Organochlorine Insecticides to the Mosquito Fish Gambusia affinis and the Bullfrog Rana catesbeiana. Mosq. News23(4): 299-303.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Growth	NOEC	Whole Organism	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Growth	NOEC	Whole Organism	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Growth	NOEC	Whole Organism	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	F	17	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	F	17.1	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Mortality	LOEC	Not Reported	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Mortality	NOEC	Not Reported	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Mortality	NOEC	Not Reported	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	LOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	LOEC	Embryo	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	LOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	LOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	LOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	LOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	NOEC	Embryo	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	NOEC	Embryo	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	NOEC	Egg	F	7000	NR	NR	ug/L	FIELDN	1995. Delorme, P.D.. The Effects of Toxaphene, Chlordane and 2,3,4,7,8-Pentachlorodibenzofuran on Lake Trout and White Sucker in an Ecosystem Experiment and the Distribution and Effects of 2,3,4,7,8- Pentachlorodibenzofuran on White Suckers. Ph.D.Thesis, Univ.of Manitoba, Winnipeg, Manitoba: 233 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	White Sucker	Fish	Fresh	Reproduction	NR	Not Reported	F	25000	NA	NR	ug/L	FIELDN	1992. Delorme, P.D.. Reproductive Success of Lake Trout and White Suckers Given Single Injections of Toxaphene, Chlordane or 2,3,4,7,8-Pentachlorodibenzofuran. In: Proc. 35th Conf. Int. Assoc. Great Lakes Res. , May 31-June 4, 1992, Univ. of Waterloo, ONT, Canada: 180.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Yellow Perch	Fish	Fresh	Mortality	LC50	Not Reported	F	18.5	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Yellow Perch	Fish	Fresh	Mortality	LC50	Not Reported	F	9.6	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..

Table C-10. Summary of Results from the EcoTox Database for Fish - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	19500	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	16300	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	13900	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	26300	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	20800	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	16900	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	Bluegill	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	48000	NR	NR	ug/L	LAB	1949. Klassen, C.W., W.A. Hasfurther, and M.K. Young. The Toxicity of Hexavalent Chromium to Sunfish and Bluegills. Proc. 4th Ind. Waste Conf. , Purdue Univ.4: 229-237.
Sulfuric acid, Chromium(3+)salt(3:2)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	9.6E+10	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Sulfuric acid, Chromium(3+)salt(3:2)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4E+10	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Sulfuric acid, Chromium(3+)salt(3:2)	Carp	Fish	Fresh	Mortality	LT50	Not Reported	T	212000*	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Sulfuric acid, Chromium(3+)salt(3:2)	Carp	Fish	Fresh	Mortality	LT50	Not Reported	T	106000*	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Sulfuric acid, Chromium(3+)salt(3:2)	Carp	Fish	Fresh	Mortality	LT50	Not Reported	T	53000*	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Sulfuric acid, Chromium(3+)salt(3:2)	Carp	Fish	Fresh	Mortality	LT50	Not Reported	T	26500*	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Chromium chloride	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Gendusa, A.C.. Toxicity of Chromium and Fluoranthene from Aqueous and Sediment Sources to Selected Freshwater Fish. Ph.D.Thesis, University of North Texas: 138 p..
Chromium chloride	Channel Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Gendusa, A.C.. Toxicity of Chromium and Fluoranthene from Aqueous and Sediment Sources to Selected Freshwater Fish. Ph.D.Thesis, University of North Texas: 138 p..
Chromium	Chinook Salmon	Fish	Fresh	Growth	NOEL	Whole Organism	T	NR	NR	NR	ug/L	LAB	2006. Farag, A.M., T. May, G.D. Marty, M. Easton, D.D. Harper, E.E. Little, and L. Cleveland. The Effect of Chronic Chromium Exposure on the Health of Chinook Salmon (Oncorhynchus tshawytscha). Aquat. Toxicol.76(3-4): 246-257.
Chromium	Chinook Salmon	Fish	Fresh	Mortality	LOEL	Not Reported	T	NR	NR	NR	ug/L	LAB	2006. Farag, A.M., T. May, G.D. Marty, M. Easton, D.D. Harper, E.E. Little, and L. Cleveland. The Effect of Chronic Chromium Exposure on the Health of Chinook Salmon (Oncorhynchus tshawytscha). Aquat. Toxicol.76(3-4): 246-257.
Chromium	Chinook Salmon	Fish	Fresh	Mortality	NOEL	Not Reported	T	NR	NR	NR	ug/L	LAB	2006. Farag, A.M., T. May, G.D. Marty, M. Easton, D.D. Harper, E.E. Little, and L. Cleveland. The Effect of Chronic Chromium Exposure on the Health of Chinook Salmon (Oncorhynchus tshawytscha). Aquat. Toxicol.76(3-4): 246-257.
Chromium	Chinook Salmon	Fish	Fresh	Reproduction	NOEL	Not Reported	T	251	NR	NR	ug/L	LAB	2006. Farag, A.M., D.D. Harper, L. Cleveland, W.G. Brumbaugh, and E.E. Little. The Potential for Chromium to Affect the Fertilization Process of Chinook Salmon (Oncorhynchus tshawytscha) in the Hanford Reach of the Columbia River, Washington, USA. Arch. Environ. Contam. Toxicol.50(4): 575-579.
Chromium chloride	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	110000	NA	NR	ug/L	LAB	1993. Venugopal, N.B.R.K., and S.L.N. Reddy. In Vivo Effects of Trivalent and Hexavalent Chromium on Renal and Hepatic ATPases of a Freshwater Teleost Anabas scandens. Environ. Monit. Assess.28(2): 131-136.
Chromium chloride	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	74880	NA	NR	ug/L	LAB	1993. Venugopal, N.B.R.K., and S.L.N. Reddy. In Vivo Effects of Trivalent and Hexavalent Chromium on Renal and Hepatic ATPases of a Freshwater Teleost Anabas scandens. Environ. Monit. Assess.28(2): 131-136.
Sulfuric acid, Chromium(3+)salt(3:2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	50000	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid, Chromium(3+)salt(3:2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	50000	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid, Chromium(3+)salt(3:2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..

Table C-10. Summary of Results from the EcoTox Database for Fish - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Chromium(3+)salt(3:2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid, Chromium(3+)salt(3:2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	28400	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid, Chromium(3+)salt(3:2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	28400	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid, Chromium(3+)salt(3:2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Chromium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	21200	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	18400	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	93600	NR	NR	ug/L	LAB	1996. Al-Akel, A.S.. Chromium Toxicity and Its Impact on Behavioural Responses in Freshwater Carp, Cyprinus carpio from Saudi Arabia. Pak. J. Zool.28(4): 361-363.
Chromium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	93600	NR	NR	ug/L	LAB	1996. Al-Akel, A.S., and M.J.K. Shamsi. Hexavalent Chromium: Toxicity and Impact on Carbohydrate Metabolism and Haematological Parameters of Carp (Cyprinus carpio L.) from Saudi Arabia. Aquat. Sci.58(1): 24-30.
Chromium	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	14300	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	15140	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	26300	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	37150	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	70000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	87100	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Sulfuric acid, Chromium(3+)salt(3:2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3.7E+08	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Sulfuric acid, Chromium(3+)salt(3:2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	25900000*	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Sulfuric acid, Chromium(3+)salt(3:2)	Common Carp	Fish	Fresh	Mortality	LT50	Not Reported	T	212000*	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Sulfuric acid, Chromium(3+)salt(3:2)	Common Carp	Fish	Fresh	Mortality	LT50	Not Reported	T	106000*	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Sulfuric acid, Chromium(3+)salt(3:2)	Common Carp	Fish	Fresh	Mortality	LT50	Not Reported	T	53000*	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Sulfuric acid, Chromium(3+)salt(3:2)	Common Carp	Fish	Fresh	Mortality	LT50	Not Reported	T	26500*	NA	NR	ug/L	LAB	1982. Wong, M.H., W.M. Lau, T.Y. Tong, W.K. Liu, and K.C. Luk. Toxic Effects of Chromic Sulphate on the Common Carp, Cyprinus carpio. Toxicol. Lett.10(2-3): 225-232.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	20000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Trivalent Chromium (Chromium Chloride, Sulfate) at Levels Lethal to Fish. J. Environ. Sci. Health A16(6): 605-610.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Trivalent Chromium (Chromium Chloride, Sulfate) at Levels Lethal to Fish. J. Environ. Sci. Health A16(6): 605-610.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	20000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Trivalent Chromium (Chromium Chloride, Sulfate) at Levels Lethal to Fish. J. Environ. Sci. Health A16(6): 605-610.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	20000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Trivalent Chromium (Chromium Chloride, Sulfate) at Levels Lethal to Fish. J. Environ. Sci. Health A16(6): 605-610.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	20000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Trivalent Chromium (Chromium Chloride, Sulfate) at Levels Lethal to Fish. J. Environ. Sci. Health A16(6): 605-610.

Table C-10. Summary of Results from the EcoTox Database for Fish - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Chromium(3+)salt(3:2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Trivalent Chromium (Chromium Chloride, Sulfate) at Levels Lethal to Fish. J. Environ. Sci. Health A16(6): 605-610.
Sulfuric acid, Chromium(3+)salt(3:2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	20000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Trivalent Chromium (Chromium Chloride, Sulfate) at Levels Lethal to Fish. J. Environ. Sci. Health A16(6): 605-610.
Sulfuric acid, Chromium(3+)salt(3:2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	20000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Trivalent Chromium (Chromium Chloride, Sulfate) at Levels Lethal to Fish. J. Environ. Sci. Health A16(6): 605-610.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	100000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	150000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	40000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	60000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	80000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Sulfuric acid, Chromium(3+)salt(3:2)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	20000	NA	NR	ug/L	LAB	1981. Muramoto, S.. Influence of Complexans (NTA, EDTA) on the Toxicity of Trivalent Chromium (Chromium Chloride, Sulfate) at Levels Lethal to Fish. J. Environ. Sci. Health A16(6): 605-610.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	1000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	10000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	35000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	5000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium chloride	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	50000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Chromium	Cutthroat Trout	Fish	Fresh	Reproduction	NOEL	Not Reported	T	279	NR	NR	ug/L	LAB	2006. Farag, A.M., D.D. Harper, L. Cleveland, W.G. Brumbaugh, and E.E. Little. The Potential for Chromium to Affect the Fertilization Process of Chinook Salmon (Oncorhynchus tshawytscha) in the Hanford Reach of the Columbia River, Washington, USA. Arch. Environ. Contam. Toxicol.50(4): 575-579.
Chromium	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	6000	NA	NR	ug/L	LAB	1988. Pickering, Q.H.. Evaluation and Comparison of Two Short-Term Fathead Minnow Tests for Estimating Chronic Toxicity. Water Res.22(7): 883-893.
Chromium	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	3000	NA	NR	ug/L	LAB	1988. Pickering, Q.H.. Evaluation and Comparison of Two Short-Term Fathead Minnow Tests for Estimating Chronic Toxicity. Water Res.22(7): 883-893.
Chromium	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Pickering, Q.H.. Evaluation and Comparison of Two Short-Term Fathead Minnow Tests for Estimating Chronic Toxicity. Water Res.22(7): 883-893.
Chromium oxide (CrO3)	Fathead Minnow	Fish	Fresh	Mortality	LC25	Not Reported	T	13878	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Chromium oxide (CrO3)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	22464	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	58000	NA	NR	ug/L	LAB	1975. Ruesink, R.G., and L.L.,Jr. Smith. The Relationship of the 96-Hour LC50 to the Lethal Threshold Concentration of Hexavalent Chromium, Phenol, and Sodium Pentachlorophenate for Fathead Minnows (Pimephales promelas Rafinesque). Trans. Am. Fish. Soc.104(3): 567-570.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	61000	NA	NR	ug/L	LAB	1975. Ruesink, R.G., and L.L.,Jr. Smith. The Relationship of the 96-Hour LC50 to the Lethal Threshold Concentration of Hexavalent Chromium, Phenol, and Sodium Pentachlorophenate for Fathead Minnows (Pimephales promelas Rafinesque). Trans. Am. Fish. Soc.104(3): 567-570.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	37000	NA	NR	ug/L	LAB	1975. Ruesink, R.G., and L.L.,Jr. Smith. The Relationship of the 96-Hour LC50 to the Lethal Threshold Concentration of Hexavalent Chromium, Phenol, and Sodium Pentachlorophenate for Fathead Minnows (Pimephales promelas Rafinesque). Trans. Am. Fish. Soc.104(3): 567-570.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	52000	NA	NR	ug/L	LAB	1975. Ruesink, R.G., and L.L.,Jr. Smith. The Relationship of the 96-Hour LC50 to the Lethal Threshold Concentration of Hexavalent Chromium, Phenol, and Sodium Pentachlorophenate for Fathead Minnows (Pimephales promelas Rafinesque). Trans. Am. Fish. Soc.104(3): 567-570.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	39000	NR	NR	ug/L	LAB	1993. Dorn, P.B., J.P. Salanitro, S.H. Evans, and L. Kravetz. Assessing the Aquatic Hazard of Some Branched and Linear Nonionic Surfactants by Biodegradation and Toxicity. Environ. Toxicol. Chem.12(10): 1751-1762.

Table C-10. Summary of Results from the EcoTox Database for Fish - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium oxide (CrO3)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	17730	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	2400	NA	NR	ug/L	LAB	1988. Pickering, Q.H.. Evaluation and Comparison of Two Short-Term Fathead Minnow Tests for Estimating Chronic Toxicity. Water Res.22(7): 883-893.
Chromium oxide (CrO3)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	6950	NR	NR	ug/L	LAB	2006. Baral, A., R. Engelken, W. Stephens, J. Farris, and R. Hannigan. Evaluation of Aquatic Toxicities of Chromium and Chromium-Containing Effluents in Reference to Chromium Electroplating Industries. Arch. Environ. Contam. Toxicol.50(4): 496-502.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	12000	NA	NR	ug/L	LAB	1988. Pickering, Q.H.. Evaluation and Comparison of Two Short-Term Fathead Minnow Tests for Estimating Chronic Toxicity. Water Res.22(7): 883-893.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NR	NR	ug/L	LAB	2000. Markle, P.J., J.R. Gully, R.B. Baird, K.M. Nakada, and J.P. Bottomley. Effects of Several Variables on Whole Effluent Toxicity Test Performance and Interpretation. Environ. Toxicol. Chem.19(1): 123-132.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NR	NR	ug/L	LAB	2000. Markle, P.J., J.R. Gully, R.B. Baird, K.M. Nakada, and J.P. Bottomley. Effects of Several Variables on Whole Effluent Toxicity Test Performance and Interpretation. Environ. Toxicol. Chem.19(1): 123-132.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NR	NR	ug/L	LAB	2000. Markle, P.J., J.R. Gully, R.B. Baird, K.M. Nakada, and J.P. Bottomley. Effects of Several Variables on Whole Effluent Toxicity Test Performance and Interpretation. Environ. Toxicol. Chem.19(1): 123-132.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NR	NR	ug/L	LAB	2000. Markle, P.J., J.R. Gully, R.B. Baird, K.M. Nakada, and J.P. Bottomley. Effects of Several Variables on Whole Effluent Toxicity Test Performance and Interpretation. Environ. Toxicol. Chem.19(1): 123-132.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NR	NR	ug/L	LAB	2000. Markle, P.J., J.R. Gully, R.B. Baird, K.M. Nakada, and J.P. Bottomley. Effects of Several Variables on Whole Effluent Toxicity Test Performance and Interpretation. Environ. Toxicol. Chem.19(1): 123-132.
Chromium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Pickering, Q.H.. Evaluation and Comparison of Two Short-Term Fathead Minnow Tests for Estimating Chronic Toxicity. Water Res.22(7): 883-893.
Chromium chloride	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Gendusa, A.C.. Toxicity of Chromium and Fluoranthene from Aqueous and Sediment Sources to Selected Freshwater Fish. Ph.D.Thesis, University of North Texas: 138 p..
Chromium oxide (CrO3)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	83000	NA	NR	ug/L	LAB	1988. Nath, K., and N. Kumar. Hexavalent Chromium: Toxicity and Its Impact on Certain Aspects of Carbohydrate Metabolism of the Freshwater Teleost, Colisa fasciatus. Sci. Total Environ.72: 175-181.
Chromium oxide (CrO3)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	72000	NA	NR	ug/L	LAB	1988. Nath, K., and N. Kumar. Hexavalent Chromium: Toxicity and Its Impact on Certain Aspects of Carbohydrate Metabolism of the Freshwater Teleost, Colisa fasciatus. Sci. Total Environ.72: 175-181.
Chromium oxide (CrO3)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	66000	NA	NR	ug/L	LAB	1988. Nath, K., and N. Kumar. Hexavalent Chromium: Toxicity and Its Impact on Certain Aspects of Carbohydrate Metabolism of the Freshwater Teleost, Colisa fasciatus. Sci. Total Environ.72: 175-181.
Chromium oxide (CrO3)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	21000*	NA	NR	ug/L	LAB	1979. Srivastava, A.K., S.J. Agrawal, and H.S. Chaudhry. Effects of Chromium on the Blood of a Freshwater Teleost. Ecotoxicol. Environ. Saf.3: 321-324.
Chromium oxide (CrO3)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	60000	NA	NR	ug/L	LAB	1988. Nath, K., and N. Kumar. Hexavalent Chromium: Toxicity and Its Impact on Certain Aspects of Carbohydrate Metabolism of the Freshwater Teleost, Colisa fasciatus. Sci. Total Environ.72: 175-181.
Chromium oxide (CrO3)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Chromium	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Chromium	ss Carp, White A	Fish	Fresh	Growth	NR	Not Reported	T	1.5	NA	NR	ug/L	LAB	1990. Mao, S., and C. Wang. The Effect of Some Pollutants on SCE of Grass Carp (Ctenopharyngodon idellus) Cells. Oceanol. Limnol. Sin. /Haiyang Yu Huzhao21(3): 205-211.
Chromium chloride	Silver Or Golden	Fish	Fresh	Mortality	LC100	Not Reported	T	330000*	NA	NR	ug/L	LAB	1977. Hamburger, B., H. Haberling, and H.R. Hitz. Comparative Tests on Toxicity to Fish Using Minnows, Trout, Golden Orfe. Arch. Fischereiwiss.28(1): 45-55.
Chromium chloride	Ide, Silver Or Golden Orfe	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Hamburger, B., H. Haberling, and H.R. Hitz. Comparative Tests on Toxicity to Fish Using Minnows, Trout, Golden Orfe. Arch. Fischereiwiss.28(1): 45-55.
Chromium	Indian Catfish	Fish	Fresh	Growth	NR		T	NR	NA	NR	ug/L	NR	1984. Pandey, G.N., and Nisha. Effect of Hexavalent Chromium on Freshwater Fish. C. A. Sel. - Environ. Pollut.13(100): 2.
Chromium	Java Tilapia	Fish	Fresh	Mortality	LC5	Not Reported	T	139500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Java Tilapia	Fish	Fresh	Mortality	LC5	Not Reported	T	145000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Java Tilapia	Fish	Fresh	Mortality	LC5	Not Reported	T	192500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Java Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	170000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.

Table C-10. Summary of Results from the EcoTox Database for Fish - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium	Java Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	179000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Java Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	217500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Java Tilapia	Fish	Fresh	Mortality	LC95	Not Reported	T	201000	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Java Tilapia	Fish	Fresh	Mortality	LC95	Not Reported	T	214500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium	Java Tilapia	Fish	Fresh	Mortality	LC95	Not Reported	T	242500	NR	NR	ug/L	LAB	1982. Kaviraj, A., and S.K. Konar. Acute Toxicity of Mercury, Chromium and Cadmium to Fish, Plankton and Worm. Geobios (Jodhpur)9(3): 97-100.
Chromium oxide (CrO3)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	1170	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Chromium oxide (CrO3)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	110000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Chromium oxide (CrO3)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	140000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Chromium oxide (CrO3)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	210000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Chromium oxide (CrO3)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	140000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Chromium oxide (CrO3)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	210000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Chromium oxide (CrO3)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	70000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Chromium chloride	Minnow	Fish	Fresh	Mortality	LC0	Not Reported	T	230000*	NA	NR	ug/L	LAB	1977. Hamburger, B., H. Haberling, and H.R. Hitz. Comparative Tests on Toxicity to Fish Using Minnows, Trout, Golden Orfe. Arch. Fischereiwiss.28(1): 45-55.
Chromium chloride	Minnow	Fish	Fresh	Mortality	LC100	Not Reported	T	160000*	NA	NR	ug/L	LAB	1977. Hamburger, B., H. Haberling, and H.R. Hitz. Comparative Tests on Toxicity to Fish Using Minnows, Trout, Golden Orfe. Arch. Fischereiwiss.28(1): 45-55.
Chromium chloride	Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	130000*	NA	NR	ug/L	LAB	1977. Hamburger, B., H. Haberling, and H.R. Hitz. Comparative Tests on Toxicity to Fish Using Minnows, Trout, Golden Orfe. Arch. Fischereiwiss.28(1): 45-55.
Chromium oxide (CrO3)	orthern Squawfis	Fish	Fresh	Mortality	LC50	Not Reported	T	182215	NR	NR	ug/L	LAB	1982. Beleau, M.H., and J.A. Bartosz. Colorado River Fisheries Project Acute Toxicity of Selected Chemicals: Data Base. In: Rep.No.6,Dep.of Fish.Resour.,Univ.of Idaho,Moscow,ID: 243-254.
Chromium	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	19100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	17800	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	17000	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium chloride	Rainbow Trout	Fish	Fresh	Growth	NR		T	1000	NA	NR	ug/L	LAB	1982. Tacon, A.G.J., and M.M. Beveridge. Effects of Dietary Trivalent Chromium on Rainbow Trout. Nutr. Rep. Int.25(1): 49-56.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Chromium oxide (CrO3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Chromium oxide (CrO3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.

Table C-10. Summary of Results from the EcoTox Database for Fish - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium oxide (CrO3)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Chromium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	100000	NA	NR	ug/L	LAB	1959. Schiffman, R.H., and P.O. Fromm. Chromium-Induced Changes in the Blood of Rainbow Trout, Salmo gairdnerii. Sewage Ind. Wastes31: 205-211.
Chromium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Chromium chloride	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9900*	NA	NR	ug/L	LAB	1977. Hamburger, B., H. Haberling, and H.R. Hitz. Comparative Tests on Toxicity to Fish Using Minnows, Trout, Golden Orfe. Arch. Fischereiwiss.28(1): 45-55.
Chromium chloride	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11200	NA	NR	ug/L	LAB	1977. Bills, T.D., L.L. Marking, and L.E. Olson. Effects of Residues of the Polychlorinated Biphenyl Aroclor 1254 on the Sensitivity of Rainbow Trout to Selected Environmental Contaminants. Prog. Fish-Cult.39(3): 150.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	24090	NR	NR	ug/L	LAB	1977. Hale, J.G.. Toxicity of Metal Mining Wastes. Bull. Environ. Contam. Toxicol.17(1): 66-73.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	4400	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Chromium	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1962. Fromm, P.O., and R.M. Stokes. Assimilation and Metabolism of Chromium by Trout. J. Water Pollut. Control Fed.34(11): 1151-1155.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	D	157	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	D	271	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	D	48	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	D	89	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	617	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	5825	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	7900	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	495	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Nitric acid, Chromium(3+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	495	NA	NR	ug/L	LAB	1984. Stevens, D.G., and G.A. Chapman. Toxicity of Trivalent Chromium to Early Life Stages of Steelhead Trout. Environ. Toxicol. Chem.3(1): 125-133.
Chromium	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	25	NR	NR	ug/L	LAB	2006. Hook, S.E., A.D. Skillman, J.A. Small, and I.R. Schultz. Gene Expression Patterns in Rainbow Trout, Oncorhynchus mykiss, Exposed to a Suite of Model Toxicants. Aquat. Toxicol.77(4): 372-385.
Chromium	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	10	NA	NR	ug/L	LAB	1962. Fromm, P.O., and R.M. Stokes. Assimilation and Metabolism of Chromium by Trout. J. Water Pollut. Control Fed.34(11): 1151-1155.
Chromium chloride	Rohu	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	6000		NC	ug/L	LAB	2004. Bhatkar, N.V.. Effects of Chlorides of Chromium, Nickel and Zinc on Melanophores of the Scales of Freshwater Carp Labeo rohita. J. Ecotoxicol. Environ. Monit.14(4): 267-272.
Chromium	Snake-Head Catfish	Fish	Fresh	Growth	NR		T	5000	NA	NR	ug/L	NR	1987. Jana, S.R., and N. Bandyopadhyaya. Effect of Heavy Metals on Some Biochemical Parameters in the Freshwater Fish Channa punctatus. Aquat. Sci. Fish. Abstr.18(4): 5486-1Q18.
Chromium oxide (CrO3)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	49000		NC	ug/L	LAB	1989. Gautam, A.K., and M.L. Gupta. Chromium Induced Hematological Anomalies in a Freshwater Fish, Channa punctatus (Bl.). J. Environ. Biol.10(3): 239-243.
Chromium	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.005	NA	NR	%	LAB	1995. Sornaraj, R., P. Baskaran, and S. Thanalakshmi. Effects of Heavy Metals on Some Physiological Responses of Air-Breathing Fish Channa punctatus (Bloch). Environ. Ecol.13(1): 202-207.
Chromium	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	19300	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	18800	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.

Table C-10. Summary of Results from the EcoTox Database for Fish - Chromium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	17700	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium oxide (CrO3)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	82790	NR	NR	ug/L	LAB	2006. Sivakumar, S., R. Karuppasamy, and S. Subathra. Acute Toxicity and Behavioural Changes in Freshwater Fish Mystus vittatus (Bloch) Exposed to Chromium (VI) Oxide. Nat. Environ. Pollut. Technol.5(3): 381-388.
Chromium oxide (CrO3)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	72110	NR	NR	ug/L	LAB	2006. Sivakumar, S., R. Karuppasamy, and S. Subathra. Acute Toxicity and Behavioural Changes in Freshwater Fish Mystus vittatus (Bloch) Exposed to Chromium (VI) Oxide. Nat. Environ. Pollut. Technol.5(3): 381-388.
Chromium oxide (CrO3)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	64420	NR	NR	ug/L	LAB	2006. Sivakumar, S., R. Karuppasamy, and S. Subathra. Acute Toxicity and Behavioural Changes in Freshwater Fish Mystus vittatus (Bloch) Exposed to Chromium (VI) Oxide. Nat. Environ. Pollut. Technol.5(3): 381-388.
Chromium oxide (CrO3)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	61670	NR	NR	ug/L	LAB	2006. Sivakumar, S., R. Karuppasamy, and S. Subathra. Acute Toxicity and Behavioural Changes in Freshwater Fish Mystus vittatus (Bloch) Exposed to Chromium (VI) Oxide. Nat. Environ. Pollut. Technol.5(3): 381-388.
Chromium	Striped Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	200000	NA	NR	ug/L	LAB	1982. Verma, S.R., M. Jain, and R.C. Dalela. A Laboratory Study to Assess Separate and In-Combination Effects of Zinc, Chromium and Nickel to the Fish Mystus vittatus. Acta Hydrochim. Hydrobiol.10(1): 23-29.
Sulfuric acid, Chromium(3+)salt(3:2)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	1200	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Chromium oxide (CrO3)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	151954	NR	NR	ug/L	LAB	2006. Begum, G., J.V. Rao, and K. Srikanth. Oxidative Stress and Changes in Locomotor Behavior and Gill Morphology of Gambusia affinis Exposed to Chromium. Toxicol. Environ. Chem.88(2): 355-365.
Chromium oxide (CrO3)	Western Mosquitofish	Fish	Fresh	Mortality	LC95	Not Reported	T	295347	NR	NR	ug/L	LAB	2006. Begum, G., J.V. Rao, and K. Srikanth. Oxidative Stress and Changes in Locomotor Behavior and Gill Morphology of Gambusia affinis Exposed to Chromium. Toxicol. Environ. Chem.88(2): 355-365.
Chromium	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	17500	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	14400	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Chromium	Zambezi Barbel	Fish	Fresh	Mortality	NR	Not Reported	T	50	NR	NR	ug/L	LAB	2006. Wegwu, M.O., and J.O. Akaninwor. Assessment of Heavy-Metal Profile of the New Calabar River and Its Impact on Juvenile Clarias gariepinus. Chem. Biodivers.3(1): 79-87.
Chromium	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	3900		NC	ug/L	LAB	1984. Vinot, H., and J.P. Larpent. Water Pollution by Uranium Ore Treatment Works. Hydrobiologia112: 125-129.

Table C-11. Summary of Results from the EcoTox Database for Fish - Cobalt

Chemical	Common Name	Class	Water Type	Scientific Name	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cobalt	Brook Trout	Fish	Fresh	Salvelinus fontinalis	Mortality	NR	Not Reported	T	40000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Brook Trout	Fish	Fresh	Salvelinus fontinalis	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Brook Trout	Fish	Fresh	Salvelinus fontinalis	Mortality	NR-LETH	Not Reported	T	55000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Brook Trout	Fish	Fresh	Salvelinus fontinalis	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Brook Trout	Fish	Fresh	Salvelinus fontinalis	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Brook Trout	Fish	Fresh	Salvelinus fontinalis	Mortality	NR-LETH	Not Reported	T	45000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt chloride (CoCl2)	Carp	Fish	Fresh	Cyprinus carpio ssp. communis	Mortality	LC50	Not Reported	T	96620	NR	NR	ug/L	LAB	1982. Kapur, K., and N.A. Yadav. The Effects of Certain Heavy Metal Salts on the Development of Eggs in Common Carp, Cyprinus carpio var. communis. Acta Hydrochim. Hydrobiol.10(5): 517-522.
Cobalt	Common Carp	Fish	Fresh	Cyprinus carpio	Growth	NR	Not Reported	T	0.00068	NA	NR	Bq/L	LAB	1989. Foulquier, L., J.P. Baudin, and A. Lamrechts. Data on 137Cs and 60Co Transfer in a River Ecosystem. J. Water Sci. /Rev. Sci. Eau.2(4): 641-658.
Cobalt	Common Carp	Fish	Fresh	Cyprinus carpio	Growth	NR		T	68	NA	NR	Bq/ml	LAB	1989. Baudin, J.P., and A.F. Fritsch. Relative Contributions of Food and Water in the Accumulation of 60Co by a Freshwater Fish. Water Res.23(7): 817-823.
Cobalt chloride (CoCl2)	Common Carp	Fish	Fresh	Cyprinus carpio	Mortality	LC50	Not Reported	T	332980	NR	NR	ug/L	LAB	1994. Das, B.K., and A. Kaviraj. Individual and Interactive Lethal Toxicity of Cadmium, Potassium Permanganate and Cobalt Chloride to Fish, Worm and Plankton. Geobios21(4): 223-227.
Cobalt nitrate	Common Carp	Fish	Fresh	Cyprinus carpio	Mortality	LC50	Not Reported	T	105000	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Cobalt nitrate	Common Carp	Fish	Fresh	Cyprinus carpio	Mortality	LC50	Not Reported	T	90200	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Cobalt nitrate	Common Carp	Fish	Fresh	Cyprinus carpio	Mortality	LC50	Not Reported	T	82700	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Cobalt chloride (CoCl2)	Common Carp	Fish	Fresh	Cyprinus carpio	Mortality	NR	Not Reported	T	121000*	NA	NR	ug/L	LAB	1963. Loeb, H.A., and W.H. Kelly. Acute Oral Toxicity of 1,496 Chemicals Force-Fed to Carp. U.S.Fish.Wildl.Serv., Sp.Sci.Rep.-Fish.No.471, Washington, D.C.: 124 p..
Cobalt chloride (CoCl2)	Common Carp	Fish	Fresh	Cyprinus carpio	Mortality	NR-LETH	Not Reported	T	NR	NA	NR	ug/L	LAB	1963. Loeb, H.A., and W.H. Kelly. Acute Oral Toxicity of 1,496 Chemicals Force-Fed to Carp. U.S.Fish.Wildl.Serv., Sp.Sci.Rep.-Fish.No.471, Washington, D.C.: 124 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Growth	LOEC	Whole Organism	T	390	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Growth	LOEC	Whole Organism	T	810	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Growth	MATC	Whole Organism	T	290	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Growth	MATC	Whole Organism	T	560	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Growth	NOEC	Whole Organism	T	210	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Growth	NOEC	Whole Organism	T	390	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Growth	NR	Whole Organism	T	NR	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Cobalt(II)formate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	LC50	Not Reported	T	12600*	NA	NR	ug/L	LAB	1981. Curtis, M.W., and C.H. Ward. Aquatic Toxicity of Forty Industrial Chemicals: Testing in Support of Hazardous Substance Spill Prevention Regulation. J. Hydrol.51: 359-367.
Cobalt chloride (CoCl2)	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	LC50	Not Reported	T	22000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	LC50	Not Reported	T	3460	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	LC50	Not Reported	T	3750	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..

Table C-11. Summary of Results from the EcoTox Database for Fish - Cobalt

Chemical	Common Name	Class	Water Type	Scientific Name	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	LC50	Not Reported	T	2720	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	LC50	Not Reported	T	2760	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	LOEC	Not Reported	T	1610	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	MATC	Not Reported	T	1140	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt chloride (CoCl2)	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	NOEC	Not Reported	T	13733	NA	NR	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, W.J. Rasnake, J.K. Fanelli, and D. Gruber. Toxicity of Cobalt to Freshwater Indicator Species as a Function of Water Hardness. Aquat. Toxicol.22(3): 163-180.
Cobalt chloride (CoCl2)	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	NOEC	Not Reported	T	6200	NA	NR	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, W.J. Rasnake, J.K. Fanelli, and D. Gruber. Toxicity of Cobalt to Freshwater Indicator Species as a Function of Water Hardness. Aquat. Toxicol.22(3): 163-180.
Cobalt chloride (CoCl2)	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	NOEC	Not Reported	T	1232	NA	NR	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, W.J. Rasnake, J.K. Fanelli, and D. Gruber. Toxicity of Cobalt to Freshwater Indicator Species as a Function of Water Hardness. Aquat. Toxicol.22(3): 163-180.
Cobalt chloride (CoCl2)	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	NOEC	Not Reported	T	1932	NA	NR	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, W.J. Rasnake, J.K. Fanelli, and D. Gruber. Toxicity of Cobalt to Freshwater Indicator Species as a Function of Water Hardness. Aquat. Toxicol.22(3): 163-180.
Cobalt chloride (CoCl2)	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	NOEC	Not Reported	T	3833	NA	NR	ug/L	LAB	1992. Diamond, J.M., E.L. Winchester, D.G. Mackler, W.J. Rasnake, J.K. Fanelli, and D. Gruber. Toxicity of Cobalt to Freshwater Indicator Species as a Function of Water Hardness. Aquat. Toxicol.22(3): 163-180.
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	NOEC	Not Reported	T	810	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Cobalt sulfate	Fathead Minnow	Fish	Fresh	Pimephales promelas	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Cobalt chloride (CoCl2)	Giant Gourami	Fish	Fresh	Colisa fasciata	Mortality	LC50	Not Reported	T	102000*	NA	NR	ug/L	LAB	1979. Srivastava, A.K., and S.J. Agrawal. Haematological Anomalies in a Fresh Water Teleost, Colisa fasciatus, on Acute Exposure to Cobalt. Acta Pharm. Toxicol.44(3): 197-199.
Cobalt	Goldfish	Fish	Fresh	Carassius auratus	Mortality	LC50	Not Reported	T	810	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Cobalt nitrate	Goldfish	Fish	Fresh	Carassius auratus	Mortality	LC50	Not Reported	T	109500	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Cobalt nitrate	Goldfish	Fish	Fresh	Carassius auratus	Mortality	LC50	Not Reported	T	66800	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Cobalt nitrate	Goldfish	Fish	Fresh	Carassius auratus	Mortality	LC50	Not Reported	T	810	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Cobalt chloride (CoCl2)	Goldfish	Fish	Fresh	Carassius auratus	Mortality	NR	Not Reported	T	1000000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Cobalt chloride (CoCl2)	Goldfish	Fish	Fresh	Carassius auratus	Mortality	NR	Not Reported	T	1000000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Cobalt chloride (CoCl2)	Goldfish	Fish	Fresh	Carassius auratus	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Cobalt chloride (CoCl2)	Guppy	Fish	Fresh	Poecilia reticulata	Mortality	LC50	Not Reported	T	1875000	NA	NR	ug/L	LAB	1991. Yarzhombek, A.A., A.E. Mikulin, and A.N. Zhdanova. Toxicity of Substances in Relation to Form of Exposure. J. Ichthyol.31(7): 99-106.
Cobalt chloride (CoCl2)	Indian Catfish	Fish	Fresh	Heteropneustes fossilis	Mortality	NR	Not Reported	T	400000	NR	NR	ug/L	LAB	1994. Das, B.K., and A. Kaviraj. Individual and Interactive Lethal Toxicity of Cadmium, Potassium Permanganate and Cobalt Chloride to Fish, Worm and Plankton. Geobios21(4): 223-227.
Cobalt chloride (CoCl2)	Indian Catfish	Fish	Fresh	Heteropneustes fossilis	Mortality	NR	Not Reported	T	454*	NA	NR	ug/L	LAB	1973. Kahn, H.A., and S.K. Mukhopadhyay. Effect of Yeast and Cobalt Chloride in Increasing Survival Rate of Hatchlings of Heteropneustes fossilis (Bloch). Indian J. Anim. Sci.43(6): 540-542.

Table C-11. Summary of Results from the EcoTox Database for Fish - Cobalt

Chemical	Common Name	Class	Water Type	Scientific Name	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cobalt chloride (CoCl2)	Medaka, High-Eyes	Fish	Fresh	Oryzias latipes	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Hiraoka, Y., S. Ishizawa, T. Kamada, and H. Okuda. Acute Toxicity of 14 Different Kinds of Metals Affecting Medaka Fry. Hiroshima J. Med. Sci.34(3): 327-330.
Cobalt	Minnow,Carp Family	Fish	Fresh	Cyprinidae	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Minnow,Carp Family	Fish	Fresh	Cyprinidae	Mortality	NR	Not Reported	T	90000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Minnow,Carp Family	Fish	Fresh	Cyprinidae	Mortality	NR-LETH	Not Reported	T	1000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Minnow,Carp Family	Fish	Fresh	Cyprinidae	Mortality	NR-LETH	Not Reported	T	500000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Minnow,Carp Family	Fish	Fresh	Cyprinidae	Mortality	NR-LETH	Not Reported	T	300000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Minnow,Carp Family	Fish	Fresh	Cyprinidae	Mortality	NR-LETH	Not Reported	T	200000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Minnow,Carp Family	Fish	Fresh	Cyprinidae	Mortality	NR-LETH	Not Reported	T	300000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Minnow,Carp Family	Fish	Fresh	Cyprinidae	Mortality	NR-LETH	Not Reported	T	150000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Minnow,Carp Family	Fish	Fresh	Cyprinidae	Mortality	NR-LETH	Not Reported	T	125000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt chloride (CoCl2)	Mummichog	Fish	Fresh	Fundulus heteroclitus	Mortality	NR-LETH	Not Reported	T	7300*	NA	NR	ug/L	LAB	1915. Thomas, A.. Effects of Certain Metallic Salts upon Fishes. Trans. Am. Fish. Soc.44: 120-124.
Cobalt	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Cobalt chloride (CoCl2)	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	LC50	Not Reported	T	1406	NR	NR	ug/L	LAB	1998. Marr, J.C.A., J.A. Hansen, J.S. Meyer, D. Cacela, T. Podrabsky, J. Lipton, and H.L. Bergman. Toxicity of Cobalt and Copper to Rainbow Trout: Application of a Mechanistic Model for Predicting Survival. Aquat. Toxicol.43(4): 225-238.
Cobalt chloride (CoCl2)	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	LC50	Not Reported	T	520	NR	NR	ug/L	LAB	1998. Marr, J.C.A., J.A. Hansen, J.S. Meyer, D. Cacela, T. Podrabsky, J. Lipton, and H.L. Bergman. Toxicity of Cobalt and Copper to Rainbow Trout: Application of a Mechanistic Model for Predicting Survival. Aquat. Toxicol.43(4): 225-238.
Cobalt chloride (CoCl2)	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	LC50	Not Reported	T	490	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Cobalt nitrate	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	LC50	Not Reported	T	470	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Cobalt chloride (CoCl2)	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	LETC	Not Reported	T	346	NR	NR	ug/L	LAB	1998. Marr, J.C.A., J.A. Hansen, J.S. Meyer, D. Cacela, T. Podrabsky, J. Lipton, and H.L. Bergman. Toxicity of Cobalt and Copper to Rainbow Trout: Application of a Mechanistic Model for Predicting Survival. Aquat. Toxicol.43(4): 225-238.
Cobalt	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	NR	Not Reported	T	30000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	NR-LETH	Not Reported	T	55000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	NR-LETH	Not Reported	T	40000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Rainbow Trout	Fish	Fresh	Oncorhynchus mykiss	Mortality	NR-LETH	Not Reported	T	35000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Tench	Fish	Fresh	Tinca tinca	Mortality	NR	Not Reported	T	125000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Tench	Fish	Fresh	Tinca tinca	Mortality	NR-LETH	Not Reported	T	1000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Tench	Fish	Fresh	Tinca tinca	Mortality	NR-LETH	Not Reported	T	500000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Tench	Fish	Fresh	Tinca tinca	Mortality	NR-LETH	Not Reported	T	300000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Tench	Fish	Fresh	Tinca tinca	Mortality	NR-LETH	Not Reported	T	200000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.

Table C-11. Summary of Results from the EcoTox Database for Fish - Cobalt

Chemical	Common Name	Class	Water Type	Scientific Name	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cobalt	Tench	Fish	Fresh	Tinca tinca	Mortality	NR-LETH	Not Reported	T	300000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt	Tench	Fish	Fresh	Tinca tinca	Mortality	NR-LETH	Not Reported	T	150000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Cobalt nitrate	Threespine Stickleback	Fish	Fresh	Gasterosteus aculeatus	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Cobalt chloride (CoCl2)	Zander	Fish	Fresh	Sander lucioperca	Mortality	NR	Not Reported	T	11*	NA	NR	ug/L	LAB	1975. Stangenberg, M.. The Influence of the Chemical Composition of Water on the Pike Perch (Lucioperca lucioperca L.) Fry from the Lake Gopio. Limnologica9(3): 421-426.
Cobalt chloride (CoCl2)	Zebra Danio	Fish	Fresh	Danio rerio	Mortality	MATC	Not Reported	T	10840	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Cobalt chloride (CoCl2)	Zebra Danio	Fish	Fresh	Danio rerio	Mortality	MATC	Not Reported	T	340	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Cobalt chloride (CoCl2)	Zebra Danio	Fish	Fresh	Danio rerio	Mortality	NOEC	Not Reported	T	3840	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Cobalt chloride (CoCl2)	Zebra Danio	Fish	Fresh	Danio rerio	Mortality	NOEC	Not Reported	T	60	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	American Butterfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1077.94	NR	NR	ug/L	LAB	2007. Jiraungkoorskul, W., S. Sahaphong, and N. Kangwanrangsan. Toxicity of Copper in Butterfish (Poronotus triacanthus): Tissues Accumulation and Ultrastructural Changes. Environ. Toxicol.22(1): 92-100.
Sulfuric acid copper(2+) salt (1:1)	American Butterfish	Fish	Fresh	Mortality	LC50	Not Reported	T	724.12	NR	NR	ug/L	LAB	2007. Jiraungkoorskul, W., S. Sahaphong, and N. Kangwanrangsan. Toxicity of Copper in Butterfish (Poronotus triacanthus): Tissues Accumulation and Ultrastructural Changes. Environ. Toxicol.22(1): 92-100.
Sulfuric acid copper(2+) salt (1:1)	American Butterfish	Fish	Fresh	Mortality	LC50	Not Reported	T	629.53	NR	NR	ug/L	LAB	2007. Jiraungkoorskul, W., S. Sahaphong, and N. Kangwanrangsan. Toxicity of Copper in Butterfish (Poronotus triacanthus): Tissues Accumulation and Ultrastructural Changes. Environ. Toxicol.22(1): 92-100.
Sulfuric acid copper(2+) salt (1:1)	merican Butterfis	Fish	Fresh	Mortality	LC50	Not Reported	T	502.95	NR	NR	ug/L	LAB	2007. Jiraungkoorskul, W., S. Sahaphong, and N. Kangwanrangsan. Toxicity of Copper in Butterfish (Poronotus triacanthus): Tissues Accumulation and Ultrastructural Changes. Environ. Toxicol.22(1): 92-100.
Copper	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	10600	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	8100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Sulfuric acid copper(2+) salt (1:1)	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	2540	NA	NR	ug/L	LAB	1978. Hinton, M.J., and A.G. Eversole. Toxicity of Ten Commonly Used Chemicals to American Eels. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies32: 599-604.
Sulfuric acid copper(2+) salt (1:1)	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1979. Hinton, M.J., and A.G. Eversole. Toxicity of Ten Chemicals Commonly Used in Aquaculture to the Black Eel Stage of the American Eel. Proc World Maricul Soc10: 554-560.
Nitric acid, Copper(2+) salt	American Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	10600	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nitric acid, Copper(2+) salt	American Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	8200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nitric acid, Copper(2+) salt	American Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	6400	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Sulfuric acid copper(2+) salt (1:1)	American Shad	Fish	Fresh	Mortality	LC50	Not Reported	F	50		NC	ug/L	LAB	2000. Dwyer, F.J., D.K. Hardesty, C.G. Ingersoll, J.L. Kunz, and D.W. Whites. Assessing Contaminant Sensitivity of American Shad, Atlantic Sturgeon and Shortnose Strugeon, Final Report - February 2000. Final Rep., U.S.Geol.Surv., Columbia Environ.Res.Ctr., Columbia, MO: 30 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	760	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Apache Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	15.8	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	313	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	46.2	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	5.93	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	65	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	92	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	131	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	2.58	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	2.7	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	23.9	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	49.3	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	67.5	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	9.6	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	LOEC	Whole Organism	T	1780000	NR	NR	ug/L	LAB	1999. Berntssen, M.H.G., A.K. Lundebye, and A. Maage. Effects of Elevated Dietary Copper Concentrations on Growth, Feed Utilisation and Nutritional Status of Atlantic Salmon (Salmo salar L.) Fry. Aquaculture174: 167-181.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	LOEC	Whole Organism	T	868000	NR	NR	ug/L	LAB	1999. Berntssen, M.H.G., A.K. Lundebye, and A. Maage. Effects of Elevated Dietary Copper Concentrations on Growth, Feed Utilisation and Nutritional Status of Atlantic Salmon (Salmo salar L.) Fry. Aquaculture174: 167-181.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	LOEL	Not Reported	T	34200		NC	ug/L	LAB	2000. Berntssen, M.H.G., A.K. Lundebye, and K. Hamre. Tissue Lipid Peroxidative Responses in Atlantic Salmon (Salmo salar L.) Parr Fed high Levels of Dietary Copper and Cadmium. Fish Physiol. Biochem.23(1): 35-48.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Not Reported	T	98000	NR	NR	ug/L	LAB	1998. Lorentzen, M., A. Maage, and K. Julshamn. Supplementing Copper to a Fish Meal Based Diet Fed to Atlantic Salmon Parr Affects Liver Copper and Selenium Concentrations. Aquac.Nutr.4(1): 67-72.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	T	868000	NR	NR	ug/L	LAB	1999. Berntssen, M.H.G., A.K. Lundebye, and A. Maage. Effects of Elevated Dietary Copper Concentrations on Growth, Feed Utilisation and Nutritional Status of Atlantic Salmon (Salmo salar L.) Fry. Aquaculture174: 167-181.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	T	98000	NR	NR	ug/L	LAB	1998. Lorentzen, M., A. Maage, and K. Julshamn. Supplementing Copper to a Fish Meal Based Diet Fed to Atlantic Salmon Parr Affects Liver Copper and Selenium Concentrations. Aquac.Nutr.4(1): 67-72.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	T	638000	NR	NR	ug/L	LAB	1999. Berntssen, M.H.G., A.K. Lundebye, and A. Maage. Effects of Elevated Dietary Copper Concentrations on Growth, Feed Utilisation and Nutritional Status of Atlantic Salmon (Salmo salar L.) Fry. Aquaculture174: 167-181.
Copper	Atlantic Salmon	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Lundebye, A.K., M.H.G. Berntssen, S.E. Wendelaar Bonga, and A. Maage. Biochemical and Physiological Responses in Atlantic Salmon (Salmo salar) Following Dietary Exposure to Copper and Cadmium. Mar. Pollut. Bull.39(1-12): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1999. Berntssen, M.H.G., K. Hylland, S.E. Wendelaar Bonga, and A. Maage. Toxic Levels of Dietary Copper in Atlantic Salmon (Salmo salar L.) Parr. Aquat. Toxicol.46(2): 87-99.
Copper	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	125	NA	NR	ug/L	LAB	1972. Wilson, R.C.H.. Prediction of Copper Toxicity in Receiving Waters. J. Fish. Res. Board Can.29(10): 1500-1502.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LETC	Not Reported	T	165		NC	ug/L	LAB	1973. Zitko, P., W.V. Carson, and W.G. Carson. Prediction of Incipient Lethal Levels of Copper to Juvenile Atlantic Salmon in the Presence of Humic Acid by Cupric Electrode. Bull. Environ. Contam. Toxicol.10(5): 265-271.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LETC	Not Reported	T	25		NC	ug/L	LAB	1973. Zitko, P., W.V. Carson, and W.G. Carson. Prediction of Incipient Lethal Levels of Copper to Juvenile Atlantic Salmon in the Presence of Humic Acid by Cupric Electrode. Bull. Environ. Contam. Toxicol.10(5): 265-271.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LETC	Not Reported	T	90		NC	ug/L	LAB	1973. Zitko, P., W.V. Carson, and W.G. Carson. Prediction of Incipient Lethal Levels of Copper to Juvenile Atlantic Salmon in the Presence of Humic Acid by Cupric Electrode. Bull. Environ. Contam. Toxicol.10(5): 265-271.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	NR	Mortality	LETC	Not Reported	T	25	NR	NR	ug/L	LAB	1972. Carson, W.G., and W.V. Carson. Toxicity of Copper and Zinc to Juvenile Atlantic Salmon in the Presence of Humic Acid and Lignosulfonates. J.Fish.Res.Board Can.Manuscript Rep.Ser.No.1181: 14 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	1780000	NR	NR	ug/L	LAB	1999. Berntssen, M.H.G., A.K. Lundebye, and A. Maage. Effects of Elevated Dietary Copper Concentrations on Growth, Feed Utilisation and Nutritional Status of Atlantic Salmon (Salmo salar L.) Fry. Aquaculture174: 167-181.
Copper	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Lundebye, A.K., M.H.G. Berntssen, S.E. Wendelaar Bonga, and A. Maage. Biochemical and Physiological Responses in Atlantic Salmon (Salmo salar) Following Dietary Exposure to Copper and Cadmium. Mar. Pollut. Bull.39(1-12): 137-144.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1966. Grande, M.. Effect of Copper and Zinc on Salmonid Fishes. Adv. Water Pollut. Res.3(1): 97-111.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1966. Grande, M.. Effect of Copper and Zinc on Salmonid Fishes. Adv. Water Pollut. Res.3(1): 97-111.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	12*	NA	NR	ug/L	LAB	1976. Peterson, R.H.. Temperature Selection of Juvenile Atlantic Salmon (Salmo salar) as Influenced by Various Toxic Substances. J. Fish. Res. Board Can.33(8): 1722-1730.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3372		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3426		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3349		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	669		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	694.5		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	689		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	577		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	242		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	375.5		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	352.5		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	178.9		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1186		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	188		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	244		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2841		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	311		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	314		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	784		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	113.3		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	178.8		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	182.4		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	60.4		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	65.4		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	71		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	115		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	50.33		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	53		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	57		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	62		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	80		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	98000	NR	NR	ug/L	LAB	1998. Lorentzen, M., A. Maage, and K. Julshamn. Supplementing Copper to a Fish Meal Based Diet Fed to Atlantic Salmon Parr Affects Liver Copper and Selenium Concentrations. Aquac.Nutr.4(1): 67-72.
Sulfuric acid copper(2+) salt (1:1)	Atlantic Sturgeon	Fish	Fresh	Mortality	LC50	Not Reported	F	150		NC	ug/L	LAB	2000. Dwyer, F.J., D.K. Hardesty, C.G. Ingersoll, J.L. Kunz, and D.W. Whites. Assessing Contaminant Sensitivity of American Shad, Atlantic Sturgeon and Shortnose Strugeon, Final Report - February 2000. Final Rep., U.S.Geol.Surv., Columbia Environ.Res.Ctr., Columbia, MO: 30 p..
Sulfuric acid copper(2+) salt (1:1)	Atlantic Sturgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	ian Redtailed Ra	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid copper(2+) salt (1:1)	ian Redtailed Ra	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid copper(2+) salt (1:1)	ian Redtailed Ra	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Copper chloride (CuCl2)	Banded Bream	Fish	Fresh	Mortality	LC50	Not Reported	D	68.1	NR	NR	umol/L	LAB	2006. Van Aardt, W.J., and M. Hough. Acute Effects of Cu on Oxygen Consumption and 96 Hr-LC50 Values in the Freshwater Fish Tilapia sparrmani (Teleostei: Cichlidae) in Mooi River Hard Water, South Africa. Afr. J. Aquat. Sci.31(2): 305-311.
Copper chloride (CuCl2)	Banded Bream	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	NR	NR	NR	umol/L	LAB	2006. Van Aardt, W.J., and M. Hough. Acute Effects of Cu on Oxygen Consumption and 96 Hr-LC50 Values in the Freshwater Fish Tilapia sparrmani (Teleostei: Cichlidae) in Mooi River Hard Water, South Africa. Afr. J. Aquat. Sci.31(2): 305-311.
Copper	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	980	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	840	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nitric acid, Copper(2+) salt	Banded Killifish	Fish	Fresh	Mortality	LC50*	Not Reported	T	1500	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Copper(2+) salt	Banded Killifish	Fish	Fresh	Mortality	LC50*	Not Reported	T	920	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nitric acid, Copper(2+) salt	Banded Killifish	Fish	Fresh	Mortality	LC50*	Not Reported	T	860	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Sulfuric acid copper(2+) salt (1:1)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	1900	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Cadmium and Copper to a Freshwater Fish Puntius arulius. Environ. Ecol.6(1): 5-8.
Sulfuric acid copper(2+) salt (1:1)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Cadmium and Copper to a Freshwater Fish Puntius arulius. Environ. Ecol.6(1): 5-8.
Sulfuric acid copper(2+) salt (1:1)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	2250	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Cadmium and Copper to a Freshwater Fish Puntius arulius. Environ. Ecol.6(1): 5-8.
Sulfuric acid copper(2+) salt (1:1)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	2700	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Cadmium and Copper to a Freshwater Fish Puntius arulius. Environ. Ecol.6(1): 5-8.
Sulfuric acid copper(2+) salt (1:1)	Bayou Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Bayou Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Bayou Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Bayou Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Bayou Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Blacknose Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	520	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Blacknose Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Blacknose Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR	Not Reported	T	130*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR	Not Reported	T	130*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8200*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4100*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8200*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4100*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	510*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	260*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	510*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Bleak	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	260*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Blue Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	686	NR	NR	ug/L	LAB	2005. Moore, J.M.. Comparison of Copper Toxicity to Channel Catfish, Ictalurus punctatus, and Blue Catfish, I. furcatus, Fingerlings. J. Appl. Aquacult.17(1): 77-84.
Copper chloride (CuCl2)	Blue Or 3-Spot Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	91.2	NR	NR	ug/L	LAB	1973. Roales, R.R.. The Effects of Sub-lethal Doses of Methylmercury and Copper, Applied Separately and Jointly, on the Immune Response of the Blue Gourami, Trichogaster trichopterus. Ph.D.Thesis, New York Univ., NY: 103 p..
Copper chloride (CuCl2)	Blue Or 3-Spot Gourami	Fish	Fresh	Mortality	LC50*	Not Reported	T	209	NA	NR	ug/L	LAB	1974. Roales, R.R., and A. Perlmutter. Toxicity of Methylmercury and Copper, Applied Singly and Jointly, to the Blue Gourami, Trichogaster trichopterus. Bull. Environ. Contam. Toxicol.12(5): 633-639.
Copper chloride (CuCl2)	Blue Or 3-Spot Gourami	Fish	Fresh	Mortality	LC50*	Not Reported	T	123	NA	NR	ug/L	LAB	1974. Roales, R.R., and A. Perlmutter. Toxicity of Methylmercury and Copper, Applied Singly and Jointly, to the Blue Gourami, Trichogaster trichopterus. Bull. Environ. Contam. Toxicol.12(5): 633-639.
Copper chloride (CuCl2)	Blue Or 3-Spot Gourami	Fish	Fresh	Mortality	LC50*	Not Reported	T	91.2	NA	NR	ug/L	LAB	1974. Roales, R.R., and A. Perlmutter. Toxicity of Methylmercury and Copper, Applied Singly and Jointly, to the Blue Gourami, Trichogaster trichopterus. Bull. Environ. Contam. Toxicol.12(5): 633-639.
Copper chloride (CuCl2)	Blue Or 3-Spot Gourami	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	398	NR	NR	ug/L	LAB	1973. Roales, R.R.. The Effects of Sub-lethal Doses of Methylmercury and Copper, Applied Separately and Jointly, on the Immune Response of the Blue Gourami, Trichogaster trichopterus. Ph.D.Thesis, New York Univ., NY: 103 p..
Copper chloride (CuCl2)	Blue Or 3-Spot Gourami	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	1973. Roales, R.R.. The Effects of Sub-lethal Doses of Methylmercury and Copper, Applied Separately and Jointly, on the Immune Response of the Blue Gourami, Trichogaster trichopterus. Ph.D.Thesis, New York Univ., NY: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1975. Benoit, D.A.. Chronic Effects of Copper on Survival, Growth, and Reproduction of the Bluegill (Lepomis macrochirus). Trans. Am. Fish. Soc.104(2): 353-358.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1984. Tsai, C.F., and K.Y. Chang. Intraspecific Variation in Copper Susceptibility of the Bluegill Sunfish. Arch. Environ. Contam. Toxicol.13(1): 93-99.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1984. Tsai, C.F., and K.Y. Chang. Intraspecific Variation in Copper Susceptibility of the Bluegill Sunfish. Arch. Environ. Contam. Toxicol.13(1): 93-99.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1984. Tsai, C.F., and K.Y. Chang. Intraspecific Variation in Copper Susceptibility of the Bluegill Sunfish. Arch. Environ. Contam. Toxicol.13(1): 93-99.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1984. Tsai, C.F., and K.Y. Chang. Intraspecific Variation in Copper Susceptibility of the Bluegill Sunfish. Arch. Environ. Contam. Toxicol.13(1): 93-99.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Soucek, D.J., and G.P. Noblet. Copper Toxicity to the Endoparasitic Trematode (Posthodiplostomum minimum) Relative to Physid Snail and Bluegill Sunfish Intermediate Hosts. Environ. Toxicol. Chem.17(12): 2512-2516.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	EC50	Not Reported	A	2800	NR	NR	ug/L	LAB	1966. Cope, O.B.. Contamination of the Freshwater Ecosystem by Pesticides. J. Appl. Ecol.3: 33-44.
Copper	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	D	4300	NR	NR	ug/L	LAB	1994. Dobbs, M.G., J.L. Farris, R.J. Reash, D.S. Cherry, and J.,Jr. Cairns. Evaluation of the Resident-Species Procedure for Developing Site-Specific Water Quality Criteria for Copper in Blaine Creek, Kentucky. Environ. Toxicol. Chem.13(6): 963-971.
Copper	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1250	NA	NR	ug/L	LAB	1968. Cairns, J.,Jr., and A. Scheier. A Comparison of the Toxicity of Some Common Industrial Waste Components Tested Individually and Combined. Prog. Fish-Cult.30(1): 3-8.
Copper chloride	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..
Copper chloride	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..
Copper chloride	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	980	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	D	1300	NA	NR	ug/L	LAB	1985. Blaylock, B.G., M.L. Frank, and J.F. McCarthy. Comparative Toxicity of Copper and Acridine to Fish, Daphnia and Algae. Environ. Toxicol. Chem.4(1): 63-71.
Copper chloride (CuCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	1981. Cairns, J.,Jr., K.W. Thompson, and A.C. Hendricks. Effects of Fluctuating, Sublethal Applications of Heavy Metal Solutions upon the Gill Ventilation Response of Bluegills (Lepomis macrochirus). EPA-600/3-81-003, U.S.EPA, Cincinnati, OH: 104 p..
Copper chloride (CuCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	D	2200	NA	NR	ug/L	LAB	1985. Blaylock, B.G., M.L. Frank, and J.F. McCarthy. Comparative Toxicity of Copper and Acridine to Fish, Daphnia and Algae. Environ. Toxicol. Chem.4(1): 63-71.
Copper chloride (CuCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1250	NR	NR	ug/L	LAB	1960. Academy of Natural Sciences. The Sensitivity of Aquatic Life to Certain Chemicals Commonly Found in Industrial Wastes. Final Rep.No.RG-3965(C2R1), U.S.Public Health Service Grant, Acad.of Nat.Sci., Philadelphia, PA: 89 p..
Nitric acid, Copper(2+) salt	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	D	620	NA	NR	ug/L	LAB	1984. Felts, P.A., and A.G. Heath. Interactions of Temperature and Sublethal Environmental Copper Exposure on the Energy Metabolism of Bluegill, Lepomis macrochirus Rafinesque. J. Fish Biol.25(4): 445-453.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	9400	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1436*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1942*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	3374*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	920	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	830	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	14000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	D	4300	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	17000	D	4400	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	610	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	780	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	1180	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	7340	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1170*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1651*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2590	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1954. Turnbull, H., J.G. Demann, and R.F. Weston. Toxicity of Various Refinery Materials to Fresh Water Fish. J. Ind. Eng. Chem.46(2): 324-333.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	3820	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	44000	NA	NR	ug/L	LAB	1954. Turnbull, H., J.G. Demann, and R.F. Weston. Toxicity of Various Refinery Materials to Fresh Water Fish. J. Ind. Eng. Chem.46(2): 324-333.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	7500	NA	NR	ug/L	LAB	1954. Turnbull, H., J.G. Demann, and R.F. Weston. Toxicity of Various Refinery Materials to Fresh Water Fish. J. Ind. Eng. Chem.46(2): 324-333.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	887*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NR	NR	ug/L	LAB	1965. Lemke, A.E.. Toxicity of Copper, Cadmium, and Zinc to the Bluegill (Lepomis macrochirus). U.S.Dep.of Health, Educ., and Welfare, R.A.Taft Sanit.Eng.Ctr., Cincinnati, OH: 19 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	D	4300	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	17000	D	4400	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	580	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	370	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1034*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1464*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1954. Turnbull, H., J.G. Demann, and R.F. Weston. Toxicity of Various Refinery Materials to Fresh Water Fish. J. Ind. Eng. Chem.46(2): 324-333.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	44000	NA	NR	ug/L	LAB	1954. Turnbull, H., J.G. Demann, and R.F. Weston. Toxicity of Various Refinery Materials to Fresh Water Fish. J. Ind. Eng. Chem.46(2): 324-333.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1954. Turnbull, H., J.G. Demann, and R.F. Weston. Toxicity of Various Refinery Materials to Fresh Water Fish. J. Ind. Eng. Chem.46(2): 324-333.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	732*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NR	NR	ug/L	LAB	1965. Lemke, A.E.. Toxicity of Copper, Cadmium, and Zinc to the Bluegill (Lepomis macrochirus). U.S.Dep.of Health, Educ., and Welfare, R.A.Taft Sanit.Eng.Ctr., Cincinnati, OH: 19 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	430	NR	NR	ug/L	LAB	1965. Lemke, A.E.. Toxicity of Copper, Cadmium, and Zinc to the Bluegill (Lepomis macrochirus). U.S.Dep.of Health, Educ., and Welfare, R.A.Taft Sanit.Eng.Ctr., Cincinnati, OH: 19 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	550	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	370	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1361*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	561*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	891*	NA	NR	ug/L	LAB	1972. Inglis, A., and E.L. Davis. Effects of Water Hardness on the Toxicity of Several Organic and Inorganic Herbicides to Fish. Tech.Pap.No.67, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NR	NR	ug/L	LAB	1965. Lemke, A.E.. Toxicity of Copper, Cadmium, and Zinc to the Bluegill (Lepomis macrochirus). U.S.Dep.of Health, Educ., and Welfare, R.A.Taft Sanit.Eng.Ctr., Cincinnati, OH: 19 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NR	NR	ug/L	LAB	1965. Lemke, A.E.. Toxicity of Copper, Cadmium, and Zinc to the Bluegill (Lepomis macrochirus). U.S.Dep.of Health, Educ., and Welfare, R.A.Taft Sanit.Eng.Ctr., Cincinnati, OH: 19 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	380	NR	NR	ug/L	LAB	1965. Lemke, A.E.. Toxicity of Copper, Cadmium, and Zinc to the Bluegill (Lepomis macrochirus). U.S.Dep.of Health, Educ., and Welfare, R.A.Taft Sanit.Eng.Ctr., Cincinnati, OH: 19 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1207	NR	NR	ug/L	LAB	1984. Tsai, C.F., and K.Y. Chang. Intraspecific Variation in Copper Susceptibility of the Bluegill Sunfish. Arch. Environ. Contam. Toxicol.13(1): 93-99.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1268	NR	NR	ug/L	LAB	1984. Tsai, C.F., and K.Y. Chang. Intraspecific Variation in Copper Susceptibility of the Bluegill Sunfish. Arch. Environ. Contam. Toxicol.13(1): 93-99.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	D	4300	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	17000	D	4100	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	550	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1981. Bishop, W.E., and R.L. Perry. Development and Evaluation of a Flow-Through Growth Inhibition Test with Duckweed (Lemna minor). In: D.R.Branson and K.L.Dickson (Eds.), Aquatic Toxicology and Hazard Assessment, 4th Conf., ASTM STP 737, Philadelphia, PA: 421-435.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	8300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1975. Benoit, D.A.. Chronic Effects of Copper on Survival, Growth, and Reproduction of the Bluegill (Lepomis macrochirus). Trans. Am. Fish. Soc.104(2): 353-358.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1971. O'Hara, J.. Alterations in Oxygen Consumption by Bluegills Exposed to Sublethal Treatment with Copper. Water Res.5(6): 321-327.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1965. Cope, O.B.. Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service. Fish and Wildl.Serv.Circ.226, Fish and Wildlife Service, Washington, D.C.: 77 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	892	NR	NR	ug/L	LAB	1998. Soucek, D.J., and G.P. Noblet. Copper Toxicity to the Endoparasitic Trematode (Posthodiplostomum minimum) Relative to Physid Snail and Bluegill Sunfish Intermediate Hosts. Environ. Toxicol. Chem.17(12): 2512-2516.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1985. Bailey, H.C., D.H.W. Liu, and H.A. Javitz. Time/Toxicity Relationships in Short-Term Static, Dynamic, and Plug-Flow Bioassays. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 193-212.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	7340	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	884	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	1300	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	2870	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	2950	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	2640	NR	NR	ug/L	LAB	2008. Johnson, B.M., M.M. Chao, O.R. Tedrow, A.D. McQueen, and J.H.,Jr. Rodgers. Responses of Lepomis macrochirus, Pimephales promelas, Hyalella azteca, Ceriodaphnia dubia, and Daphnia magna to Exposures of Algimycin PWF and Copper Sulfate Pentahydrate. J. Aquat. Plant Manage.46: 176-183.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Ellgaard, E.G., and J.L. Guillot. Kinetic Analysis of the Swimming Behaviour of Bluegill Sunfish, Lepomis macrochirus Rafinesque, Exposed to Copper: Hypoactivity Induced by Sublethal Concentrations. J. Fish Biol.33: 601-608.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	770	NR	NR	ug/L	LAB	1960. Academy of Natural Sciences. The Sensitivity of Aquatic Life to Certain Chemicals Commonly Found in Industrial Wastes. Final Rep.No.RG-3965(C2R1), U.S.Public Health Service Grant, Acad.of Nat.Sci., Philadelphia, PA: 89 p..
Sulfuric acid copper(2+)salt basic	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	1788000	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+)salt basic	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	180000	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Copper chloride (CuCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	890	NA	NR	ug/L	LAB	1954. Trama, F.B.. The Acute Toxicity of Copper to the Common Bluegill (Lepomis macrochirus Rafinesque). Not. Nat. (Phila.)257: 1-13.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	1100	NA	NR	ug/L	LAB	1980. Thompson, K.W., A.C. Hendricks, and J.,Jr. Cairns. Acute Toxicity of Zinc and Copper Singly and in Combination to the Bluegill (Lepomis macrochirus). Bull. Environ. Contam. Toxicol.25(1): 122-129.
Copper chloride (CuCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	900	NA	NR	ug/L	LAB	1980. Thompson, K.W., A.C. Hendricks, and J.,Jr. Cairns. Acute Toxicity of Zinc and Copper Singly and in Combination to the Bluegill (Lepomis macrochirus). Bull. Environ. Contam. Toxicol.25(1): 122-129.
Copper chloride (CuCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	710	NA	NR	ug/L	LAB	1954. Trama, F.B.. The Acute Toxicity of Copper to the Common Bluegill (Lepomis macrochirus Rafinesque). Not. Nat. (Phila.)257: 1-13.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	10700	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	860	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	D	2500	NA	NR	ug/L	LAB	1978. Richey, D., and D. Roseboom. Acute Toxicity of Copper to Some Fishes in high Alkalinity Water. Circular 131, Dep.Registration & Education, State of IL: 24 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	D	3700	NA	NR	ug/L	LAB	1978. Richey, D., and D. Roseboom. Acute Toxicity of Copper to Some Fishes in high Alkalinity Water. Circular 131, Dep.Registration & Education, State of IL: 24 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	900	NA	NR	ug/L	LAB	1954. Trama, F.B.. The Acute Toxicity of Copper to the Common Bluegill (Lepomis macrochirus Rafinesque). Not. Nat. (Phila.)257: 1-13.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	10200	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	740	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	770	NA	NR	ug/L	LAB	1954. Trama, F.B.. The Acute Toxicity of Copper to the Common Bluegill (Lepomis macrochirus Rafinesque). Not. Nat. (Phila.)257: 1-13.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	10000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	10200	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	200	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	660	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LETC	Not Reported	T	1192	NR	NR	ug/L	LAB	1984. Tsai, C.F., and K.Y. Chang. Intraspecific Variation in Copper Susceptibility of the Bluegill Sunfish. Arch. Environ. Contam. Toxicol.13(1): 93-99.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LETC	Not Reported	T	1206	NR	NR	ug/L	LAB	1984. Tsai, C.F., and K.Y. Chang. Intraspecific Variation in Copper Susceptibility of the Bluegill Sunfish. Arch. Environ. Contam. Toxicol.13(1): 93-99.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LETC	Not Reported	T	1203	NR	NR	ug/L	LAB	1984. Tsai, C.F., and K.Y. Chang. Intraspecific Variation in Copper Susceptibility of the Bluegill Sunfish. Arch. Environ. Contam. Toxicol.13(1): 93-99.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LETC	Not Reported	T	1206	NR	NR	ug/L	LAB	1984. Tsai, C.F., and K.Y. Chang. Intraspecific Variation in Copper Susceptibility of the Bluegill Sunfish. Arch. Environ. Contam. Toxicol.13(1): 93-99.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LETC	Not Reported	T	1203	NR	NR	ug/L	LAB	1984. Tsai, C.F., and K.Y. Chang. Intraspecific Variation in Copper Susceptibility of the Bluegill Sunfish. Arch. Environ. Contam. Toxicol.13(1): 93-99.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	LOEC	Not Reported	T	363	NR	NR	ug/L	LAB	2008. Johnson, B.M., M.M. Chao, O.R. Tedrow, A.D. McQueen, and J.H.,Jr. Rodgers. Responses of Lepomis macrochirus, Pimephales promelas, Hyalella azteca, Ceriodaphnia dubia, and Daphnia magna to Exposures of Algimycin PWF and Copper Sulfate Pentahydrate. J. Aquat. Plant Manage.46: 176-183.
Copper	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDA	1985. Harrison, F.L., and J.R. Lam. Copper-Binding Proteins in Liver of Bluegills Exposed to Increased Soluble Copper Under Field and Laboratory Conditions. Environ. Health Perspect.65: 125-132.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1975. Benoit, D.A.. Chronic Effects of Copper on Survival, Growth, and Reproduction of the Bluegill (Lepomis macrochirus). Trans. Am. Fish. Soc.104(2): 353-358.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1975. Benoit, D.A.. Chronic Effects of Copper on Survival, Growth, and Reproduction of the Bluegill (Lepomis macrochirus). Trans. Am. Fish. Soc.104(2): 353-358.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	NR	D	NR	ug/L	LAB	1984. Tonelli, R.. A Mathematical Analysis of Acute Toxicity of Copper to Bluegills (Lepomis macrochirus). M.S.Thesis, Manhattan College, Bronx, NY: 52 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1567	NR	NR	ug/L	LAB	1998. Soucek, D.J., and G.P. Noblet. Copper Toxicity to the Endoparasitic Trematode (Posthodiplostomum minimum) Relative to Physid Snail and Bluegill Sunfish Intermediate Hosts. Environ. Toxicol. Chem.17(12): 2512-2516.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	880	NA	NR	ug/L	LAB	1988. Bills, T.D., and L.L. Marking. Control of Nuisance Populations of Crayfish with Traps and Toxicants. Prog. Fish-Cult.50: 103-106.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	162	NA	NR	ug/L	LAB	1975. Benoit, D.A.. Chronic Effects of Copper on Survival, Growth, and Reproduction of the Bluegill (Lepomis macrochirus). Trans. Am. Fish. Soc.104(2): 353-358.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	524	NR	NR	ug/L	LAB	1998. Soucek, D.J., and G.P. Noblet. Copper Toxicity to the Endoparasitic Trematode (Posthodiplostomum minimum) Relative to Physid Snail and Bluegill Sunfish Intermediate Hosts. Environ. Toxicol. Chem.17(12): 2512-2516.
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	539	D	326	ug/L	LAB	1984. Tonelli, R.. A Mathematical Analysis of Acute Toxicity of Copper to Bluegills (Lepomis macrochirus). M.S.Thesis, Manhattan College, Bronx, NY: 52 p..
Sulfuric acid copper(2+) salt (1:1)	Bluegill	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1975. Benoit, D.A.. Chronic Effects of Copper on Survival, Growth, and Reproduction of the Bluegill (Lepomis macrochirus). Trans. Am. Fish. Soc.104(2): 353-358.
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Horning, W.B., and T.W. Neiheisel. Chronic Effect of Copper on the Bluntnose Minnow, Pimephales notatus (Rafinesque). Arch. Environ. Contam. Toxicol.8(5): 545-552.
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Growth	NR		T	102.7	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Growth	NR		T	90	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	D	510	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	D	660	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	D	300	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	D	820	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	D	330	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	160	D	150	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	D	400	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	D	370	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21000	D	330	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	D	340	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	D	1300	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	D	390	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5700	D	420	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	D	320	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9000	D	430	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9700	D	420	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12100	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	25000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3700	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4700	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5700	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5800	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8900	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9200	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9200	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9200	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2700	D	490	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	D	660	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12100	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	25000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3400	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3700	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4700	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5700	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5800	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7500	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9200	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9200	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9700	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	D	620	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1979. Horning, W.B., and T.W. Neiheisel. Chronic Effect of Copper on the Bluntnose Minnow, Pimephales notatus (Rafinesque). Arch. Environ. Contam. Toxicol.8(5): 545-552.
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1979. Horning, W.B., and T.W. Neiheisel. Chronic Effect of Copper on the Bluntnose Minnow, Pimephales notatus (Rafinesque). Arch. Environ. Contam. Toxicol.8(5): 545-552.
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1979. Horning, W.B., and T.W. Neiheisel. Chronic Effect of Copper on the Bluntnose Minnow, Pimephales notatus (Rafinesque). Arch. Environ. Contam. Toxicol.8(5): 545-552.
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2700	D	490	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4400	D	510	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6800	D	390	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	90	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	102.7	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	90	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	193	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Reproduction	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Horning, W.B., and T.W. Neiheisel. Chronic Effect of Copper on the Bluntnose Minnow, Pimephales notatus (Rafinesque). Arch. Environ. Contam. Toxicol.8(5): 545-552.
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Reproduction	NR		T	102.7	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Reproduction	NR		T	113	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Bluntnose Minnow	Fish	Fresh	Reproduction	NR		T	90	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Copper	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Copper	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	21	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Copper	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Copper	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	840	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Copper	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	16	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Copper	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Copper	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	410	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Copper	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	8.7	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Sulfuric acid copper(2+) salt (1:1)	Bony Fishes	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	FIELDA	1975. Shukla, S.S., and R.M. Roy. Studies on the Comparative Molluscicide Effects of N-Tritylmorpholine and Copper Sulphate on the Common Aquatic Snails in Andhra Pradesh (India). Trop. Anim. Health Prod.7(1): 45-50.
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	1330	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	410	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	570	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	364	NA	NR	ug/L	LAB	1996. Buhl, K.J., and S.J. Hamilton. Toxicity of Inorganic Contaminants, Individually and in Environmental Mixtures, to Three Endangered Fishes (Colorado Squawfish, Bonytail, and Razorback Sucker). Arch. Environ. Contam. Toxicol.30(1): 84-92.
Sulfuric acid copper(2+) salt (1:1)	Bonytail	Fish	Fresh	Mortality	NR	Not Reported	T	231	NA	NR	ug/L	LAB	1996. Buhl, K.J., and S.J. Hamilton. Toxicity of Inorganic Contaminants, Individually and in Environmental Mixtures, to Three Endangered Fishes (Colorado Squawfish, Bonytail, and Razorback Sucker). Arch. Environ. Contam. Toxicol.30(1): 84-92.
Copper	Brook Trout	Fish	Fresh	Growth	IC50	Not Reported	T	187	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Brook Trout	Fish	Fresh	Growth	IC50	Not Reported	T	292	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Brook Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	158	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Brook Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	160	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Growth	LOEL	Not Reported	T	5	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Growth	LOEL	Not Reported	T	8	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Copper	Brook Trout	Fish	Fresh	Growth	MATC	Not Reported	T	109	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Brook Trout	Fish	Fresh	Growth	MATC	Not Reported	T	112	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Copper	Brook Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	75	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Brook Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	79	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	5	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Copper	Brook Trout	Fish	Fresh	Growth	NR		T	9.4	NA	NR	ug/L	LAB	1974. McKim, J.M., and D.A. Benoit. Duration of Toxicity Tests for Establishing "No Effect" Concentrations for Copper with Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.31(4): 449-452.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Growth	NR		T	5	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Growth	NR		T	8	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	NR	Growth	NR	Whole Organism	T	22.3	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	NR	Growth	NR	Whole Organism	T	43.5	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	438	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	158	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	13	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	49	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Copper	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	312	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Copper	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	75	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	7	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	21	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Copper	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	9.4	NA	NR	ug/L	LAB	1974. McKim, J.M., and D.A. Benoit. Duration of Toxicity Tests for Establishing "No Effect" Concentrations for Copper with Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.31(4): 449-452.
Copper	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	9.4	NA	NR	ug/L	LAB	1974. McKim, J.M., and D.A. Benoit. Duration of Toxicity Tests for Establishing "No Effect" Concentrations for Copper with Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.31(4): 449-452.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	4000	NA	NR	ug/L	NR	1927. Belding, D.L.. Toxicity Experiments with Fish in Reference to Trade Waste Pollution. I. The Problem of Water Pollution. Trans. Am. Fish. Soc.57: 100-119.
Copper	Brook Trout	Fish	Fresh	Reproduction	NR		T	9.4	NA	NR	ug/L	LAB	1974. McKim, J.M., and D.A. Benoit. Duration of Toxicity Tests for Establishing "No Effect" Concentrations for Copper with Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.31(4): 449-452.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Reproduction	NR	Egg	T	NR	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.
Sulfuric acid copper(2+) salt (1:1)	Brook Trout	Fish	Fresh	Reproduction	NR	Egg	T	NR	NR	NR	ug/L	LAB	1971. McKim, J.M., and D.A. Benoit. Effects of Long-Term Exposures to Copper on Survival, Growth, and Reproduction of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.28: 655-662.
Sulfuric acid copper(2+) salt (1:1)	Brown Bullhead	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Brown Bullhead	Fish	Fresh	Mortality	LC50	Not Reported	T	15000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Brown Bullhead	Fish	Fresh	Mortality	LC50	Not Reported	T	5800	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Brown Bullhead	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	D	570	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Brown Bullhead	Fish	Fresh	Mortality	LC50	Not Reported	T	520	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Brown Bullhead	Fish	Fresh	Mortality	LC50*	Not Reported	T	186	NA	NR	ug/L	LAB	1973. Brungs, W.A., E.N. Leonard, and J.M. McKim. Acute and Long-Term Accumulation of Copper by the Brown Bullhead, Ictalurus nebulosus. J. Fish. Res. Board Can.30(4): 583-586.
Sulfuric acid copper(2+) salt (1:1)	Brown Bullhead	Fish	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Brungs, W.A., E.N. Leonard, and J.M. McKim. Acute and Long-Term Accumulation of Copper by the Brown Bullhead, Ictalurus nebulosus. J. Fish. Res. Board Can.30(4): 583-586.
Sulfuric acid copper(2+) salt (1:1)	Brown Bullhead	Fish	Fresh	Mortality	LC50*	Not Reported	T	180	NA	NR	ug/L	LAB	1972. Christensen, G.M., J.M. McKim, W.A. Brungs, and E.P. Hunt. Changes in the Blood of the Brown Bullhead (Ictalurus nebulosus (Lesueur)) Following Short and Long Term Exposure to Copper (II). Toxicol. Appl. Pharmacol.23(3): 417-427.
Copper	Brown Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1988. Leland, H.V., J.L. Carter, S.V. Fend, and T.M. Jenkins. Effects of Copper on Structure and Function of Biological Communities in a Sierra Nevada, California, Stream. Aquat. Toxicol.11(3-4): 409.
Sulfuric acid copper(2+) salt (1:1)	Brown Trout	Fish	NR	Growth	NR	Whole Organism	T	22	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Brown Trout	Fish	NR	Growth	NR	Whole Organism	T	43.2	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Brown Trout	Fish	NR	Growth	NR	Whole Organism	T	100.6	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Brown Trout	Fish	NR	Growth	NR	Whole Organism	T	511.5	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Brown Trout	Fish	NR	Growth	NR	Whole Organism	T	46.5	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Brown Trout	Fish	NR	Growth	NR	Whole Organism	T	104.6	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Copper chloride	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Effects of Six Trace Metals on Calcium Fluxes in Brown Trout (Salmo trutta L.) in Soft Water. J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.: 537-542.
Copper chloride (CuCl)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	82	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Embryonic and Larval Development of Brown Trout, Salmo trutta L.: Exposure to Trace Metal Mixtures in Soft Water. J. Fish Biol.38: 773-787.
Copper chloride (CuCl)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	84	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Embryonic and Larval Development of Brown Trout, Salmo trutta L.: Exposure to Trace Metal Mixtures in Soft Water. J. Fish Biol.38: 773-787.
Copper chloride (CuCl2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	30	NA	NR	ug/L	LAB	1995. Beaumont, M.W., P.J. Butler, and E.W. Taylor. Exposure of Brown Trout, Salmo trutta, to Sub-lethal Copper Concentrations in Soft Acidic Water and Its Effect upon Sustained Swimming Performance. Aquat. Toxicol.33(1): 45-63.
Copper chloride (CuCl2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	nmol/L	LAB	1989. Sayer, M.D.J., J.P. Reader, and R. Morris. The Effect of Calcium Concentration on the Toxicity of Copper, Lead and Zinc to Yolk-Sac Fry of Brown Trout, Salmo trutta L., in Soft, Acid Water. J. Fish Biol.35(3): 323-332.
Sulfuric acid copper(2+) salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1966. Grande, M.. Effect of Copper and Zinc on Salmonid Fishes. Adv. Water Pollut. Res.3(1): 97-111.
Copper chloride (CuCl2)	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	20	NA	NR	ug/L	LAB	1995. Beaumont, M.W., P.J. Butler, and E.W. Taylor. Exposure of Brown Trout, Salmo trutta, to Sub-lethal Copper Concentrations in Soft Acidic Water and Its Effect upon Sustained Swimming Performance. Aquat. Toxicol.33(1): 45-63.
Copper chloride (CuCl2)	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5	NA	NR	ug/L	LAB	1995. Beaumont, M.W., P.J. Butler, and E.W. Taylor. Exposure of Brown Trout, Salmo trutta, to Sub-lethal Copper Concentrations in Soft Acidic Water and Its Effect upon Sustained Swimming Performance. Aquat. Toxicol.33(1): 45-63.
Sulfuric acid copper(2+) salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1700	NR	NR	ug/L	LAB	1999. Sanchez-Galan, S., A.R. Linde, and E. Garcia-Vazquez. Brown Trout and European Minnow as Target Species for Genotoxicity Tests: Differential Sensitivity to Heavy Metals. Ecotoxicol. Environ. Saf.43(3): 301-304.
Sulfuric acid copper(2+) salt (1:1)	Brown Trout	Fish	Fresh	Reproduction	LOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid copper(2+) salt (1:1)	Brown Trout	Fish	Fresh	Reproduction	NOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid copper(2+) salt (1:1)	Brown Trout	Fish	Fresh	Reproduction	NOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Copper chloride (CuCl2)	Bull Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	179		NC	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, and D. Cacela. Effects of Copper Exposure on Growth and Survival of Juvenile Bull Trout. Trans. Am. Fish. Soc.131(4): 690-697.
Copper chloride (CuCl2)	Bull Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	179		NC	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, and D. Cacela. Effects of Copper Exposure on Growth and Survival of Juvenile Bull Trout. Trans. Am. Fish. Soc.131(4): 690-697.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Bull Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	179		NC	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, and D. Cacela. Effects of Copper Exposure on Growth and Survival of Juvenile Bull Trout. Trans. Am. Fish. Soc.131(4): 690-697.
Copper chloride (CuCl2)	Bull Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	179		NC	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, and D. Cacela. Effects of Copper Exposure on Growth and Survival of Juvenile Bull Trout. Trans. Am. Fish. Soc.131(4): 690-697.
Copper chloride (CuCl2)	Bull Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	179		NC	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, and D. Cacela. Effects of Copper Exposure on Growth and Survival of Juvenile Bull Trout. Trans. Am. Fish. Soc.131(4): 690-697.
Copper chloride (CuCl2)	Bull Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	179		NC	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, and D. Cacela. Effects of Copper Exposure on Growth and Survival of Juvenile Bull Trout. Trans. Am. Fish. Soc.131(4): 690-697.
Copper chloride (CuCl2)	Bull Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	179		NC	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, and D. Cacela. Effects of Copper Exposure on Growth and Survival of Juvenile Bull Trout. Trans. Am. Fish. Soc.131(4): 690-697.
Copper chloride (CuCl2)	Bull Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	111		NC	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, and D. Cacela. Effects of Copper Exposure on Growth and Survival of Juvenile Bull Trout. Trans. Am. Fish. Soc.131(4): 690-697.
Sulfuric acid copper(2+) salt (1:1)	Burbot	Fish	Fresh	Reproduction	LOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid copper(2+) salt (1:1)	Burbot	Fish	Fresh	Reproduction	LOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid copper(2+) salt (1:1)	Burbot	Fish	Fresh	Reproduction	NOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid copper(2+) salt (1:1)	Cape Fear Shiner	Fish	Fresh	Growth	IC25	Not Reported	T	34000	NR	NR	ug/L	LAB	2005. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, T. Augspurger, T.J. Canfield, D.R. Mount, and F.L.. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part III. Effluent Toxicity Tests. Arch. Environ. Contam. Toxicol.48(2): 174-183.
Sulfuric acid copper(2+) salt (1:1)	Cape Fear Shiner	Fish	Fresh	Growth	IC25	Not Reported	T	5300	NR	NR	ug/L	LAB	2005. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, T. Augspurger, T.J. Canfield, D.R. Mount, and F.L.. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part III. Effluent Toxicity Tests. Arch. Environ. Contam. Toxicol.48(2): 174-183.
Sulfuric acid copper(2+) salt (1:1)	Cape Fear Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	18760	NR	NR	ug/L	LAB	1982. Kapur, K., and N.A. Yadav. The Effects of Certain Heavy Metal Salts on the Development of Eggs in Common Carp, Cyprinus carpio var. communis. Acta Hydrochim. Hydrobiol.10(5): 517-522.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	550	NR	NR	ug/L	LAB	2001. Ramesh, M.. Toxicity of Copper Sulphate on Some Haematological Parameters of a Freshwater Teleost Cyprinus carpio var. Communis. J. Indian Fish. Assoc.28: 131-136.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	41.1	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	123.4	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	203.6	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	123.4	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	163.7	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	123.4	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	157.7	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	40	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	10	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Sulfuric acid copper(2+) salt (1:1)	Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	60	NR	NR	ug/L	LAB	2000. Ganesh, N., T.R.C. Gupta, R.J. Katti, and K.S. Udupa. Acute Toxicity of Copper on Three Life Stages of Common Carp, Cyprinus carpio var. Communis. Pollut. Res.19(1): 91-93.
Copper chloride (CuCl2)	Carp, Hawk Fish	Fish	Fresh	Growth	LOEC	Not Reported	T	150	NR	NR	ug/L	LAB	2009. Mohanty, M., S. Adhikari, P. Mohanty, and N. Sarangi. Role of Waterborne Copper on Survival, Growth and Feed Intake of Indian Major Carp, Cirrhinus mrigala Hamilton. Bull. Environ. Contam. Toxicol.82(5): 559-563.
Copper chloride (CuCl2)	Carp, Hawk Fish	Fish	Fresh	Growth	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2009. Mohanty, M., S. Adhikari, P. Mohanty, and N. Sarangi. Role of Waterborne Copper on Survival, Growth and Feed Intake of Indian Major Carp, Cirrhinus mrigala Hamilton. Bull. Environ. Contam. Toxicol.82(5): 559-563.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1993. Smith, V.R.P., S. George, and S.S. Manohardas. Monovalent Cation Flux in the Tissues of the Fish Cirrhina mrigala Exposed to Copper. J.Ecobiol.5(2): 121-125.
Copper	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1993. Smith, V.R.P., S. George, and S.S. Manohardas. Monovalent Cation Flux in the Tissues of the Fish Cirrhina mrigala Exposed to Copper. J.Ecobiol.5(2): 121-125.
Copper	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1993. Smith, V.R.P., S. George, and S.S. Manohardas. Monovalent Cation Flux in the Tissues of the Fish Cirrhina mrigala Exposed to Copper. J.Ecobiol.5(2): 121-125.
Copper	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1993. Smith, V.R.P., S. George, and S.S. Manohardas. Monovalent Cation Flux in the Tissues of the Fish Cirrhina mrigala Exposed to Copper. J.Ecobiol.5(2): 121-125.
Copper	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1993. Smith, V.R.P., S. George, and S.S. Manohardas. Monovalent Cation Flux in the Tissues of the Fish Cirrhina mrigala Exposed to Copper. J.Ecobiol.5(2): 121-125.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.164		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.111		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.1		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.086		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.078		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.071		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.063		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.057		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.053		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1984. Verma, S.R., I.P. Tonk, A.K. Gupta, and M. Saxena. Evaluation of an Application Factor for Determining the Safe Concentration of Agricultural and Industrial Chemicals. Water Res.18(1): 111-115.
Copper chloride (CuCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2009. Mohanty, M., S. Adhikari, P. Mohanty, and N. Sarangi. Role of Waterborne Copper on Survival, Growth and Feed Intake of Indian Major Carp, Cirrhinus mrigala Hamilton. Bull. Environ. Contam. Toxicol.82(5): 559-563.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. Verma, S.R., I.P. Tonk, A.K. Gupta, and M. Saxena. Evaluation of an Application Factor for Determining the Safe Concentration of Agricultural and Industrial Chemicals. Water Res.18(1): 111-115.
Sulfuric acid copper(2+) salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	40000*	NA	NR	ug/L	LAB	1978. Singh, S.P., and N.K. Yadav. Toxicity of Some Herbicides to Major Carp Fingerlings. Indian J. Ecol.5(2): 141-147.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	10540	NA	NR	ug/L	LAB	1990. Ebele, S., A.A. Oladimeji, and J.A. Daramola. Molluscicidal and Piscicidal Properties of Copper(II) Tetraoxosulfate(VI) on Bulinus globosus (Morelet) and Clarias anguillaris (L.). Aquat. Toxicol.17(3): 231-238.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	6570	NA	NR	ug/L	LAB	1990. Ebele, S., A.A. Oladimeji, and J.A. Daramola. Molluscicidal and Piscicidal Properties of Copper(II) Tetraoxosulfate(VI) on Bulinus globosus (Morelet) and Clarias anguillaris (L.). Aquat. Toxicol.17(3): 231-238.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1990. Ebele, S., A.A. Oladimeji, and J.A. Daramola. Molluscicidal and Piscicidal Properties of Copper(II) Tetraoxosulfate(VI) on Bulinus globosus (Morelet) and Clarias anguillaris (L.). Aquat. Toxicol.17(3): 231-238.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El-Domiaty, F.I. Mousa, and W.E. Abu-Samra. Variation in the Blood Chemistry of Juvenile Clarias lazera Subsequent to Acute and Subacute Copper Exposure. Bull. Inst. Oceanogr. Fish. (Cairo)13(2): 65-77.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4280	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Effect of Lethal Concentrations of Copper on Mystus bleekeri (Day). Acta Hydrochim. Hydrobiol.16(5): 547-550.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4170	NA	NR	ug/L	LAB	1981. Gupta, A.K., and V.K. Rajbanshi. Measurement of Acute Toxicity of Copper to the Freshwater Teleost, Mystus bleekeri (Day) Using Bioassay, Statistical and Histopathological Methods. Arch. Hydrobiol.91(4): 427-434.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4050	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Effect of Lethal Concentrations of Copper on Mystus bleekeri (Day). Acta Hydrochim. Hydrobiol.16(5): 547-550.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	776	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Effect of Lethal Concentrations of Copper on Mystus bleekeri (Day). Acta Hydrochim. Hydrobiol.16(5): 547-550.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1850	NA	NR	ug/L	LAB	1981. Gupta, A.K., and V.K. Rajbanshi. Measurement of Acute Toxicity of Copper to the Freshwater Teleost, Mystus bleekeri (Day) Using Bioassay, Statistical and Histopathological Methods. Arch. Hydrobiol.91(4): 427-434.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1690	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Effect of Lethal Concentrations of Copper on Mystus bleekeri (Day). Acta Hydrochim. Hydrobiol.16(5): 547-550.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	950	NA	NR	ug/L	LAB	1981. Gupta, A.K., and V.K. Rajbanshi. Measurement of Acute Toxicity of Copper to the Freshwater Teleost, Mystus bleekeri (Day) Using Bioassay, Statistical and Histopathological Methods. Arch. Hydrobiol.91(4): 427-434.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1084	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Effect of Lethal Concentrations of Copper on Mystus bleekeri (Day). Acta Hydrochim. Hydrobiol.16(5): 547-550.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	850	NA	NR	ug/L	LAB	1981. Gupta, A.K., and V.K. Rajbanshi. Measurement of Acute Toxicity of Copper to the Freshwater Teleost, Mystus bleekeri (Day) Using Bioassay, Statistical and Histopathological Methods. Arch. Hydrobiol.91(4): 427-434.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	829	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. Effect of Lethal Concentrations of Copper on Mystus bleekeri (Day). Acta Hydrochim. Hydrobiol.16(5): 547-550.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	4500	NA	NR	ug/L	LAB	1987. El Domiaty, N.A.. Stress Response of Juvenile Clarias lazera Elicited by Copper. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.88(2): 259-262.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	4250	NA	NR	ug/L	LAB	1987. El Domiaty, N.A.. Stress Response of Juvenile Clarias lazera Elicited by Copper. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.88(2): 259-262.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	4080	NA	NR	ug/L	LAB	1987. El Domiaty, N.A.. Stress Response of Juvenile Clarias lazera Elicited by Copper. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.88(2): 259-262.
Sulfuric acid copper(2+) salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	3200	NA	NR	ug/L	LAB	1987. El Domiaty, N.A.. Stress Response of Juvenile Clarias lazera Elicited by Copper. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.88(2): 259-262.
Copper chloride (CuCl)	Catfish Order	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	FIELDA	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Sulfuric acid copper(2+) salt (1:1)	Catfish Order	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	FIELDA	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Sulfuric acid copper(2+) salt (1:1)	Central Stoneroller	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	D	910	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Central Stoneroller	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	D	540	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Central Stoneroller	Fish	Fresh	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Central Stoneroller	Fish	Fresh	Mortality	LC50	Not Reported	T	870	D	310	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	490	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	LOEC	Not Reported	T	1500	NR	NR	ug/L	LAB	2006. Rabago-Castro, J.L., J.G. Sanchez, R. Perez-Castaneda, and A. Gonzalez-Gonzalez. Effects of the Prophylactic Use of Romet-30 and Copper Sulfate on Growth, Condition and Feeding Indices in Channel Catfish (Ictalurus punctatus). Aquaculture253(1-4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	LOEL	Not Reported	T	18	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	LOEL	Not Reported	T	19	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NOEC	Whole Organism	T	20000		NC	ug/L	LAB	1989. Gatlin III, D.M., H.F. Phillips, and E.L. Torrans. Effects of Various Levels of Dietary Copper and Zinc on Channel Catfish. Aquaculture76(1-2): 127-134.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NOEC	Not Reported	T	1500	NR	NR	ug/L	LAB	2006. Rabago-Castro, J.L., J.G. Sanchez, R. Perez-Castaneda, and A. Gonzalez-Gonzalez. Effects of the Prophylactic Use of Romet-30 and Copper Sulfate on Growth, Condition and Feeding Indices in Channel Catfish (Ictalurus punctatus). Aquaculture253(1-4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NOEC	Not Reported	T	1500	NR	NR	ug/L	LAB	2006. Rabago-Castro, J.L., J.G. Sanchez, R. Perez-Castaneda, and A. Gonzalez-Gonzalez. Effects of the Prophylactic Use of Romet-30 and Copper Sulfate on Growth, Condition and Feeding Indices in Channel Catfish (Ictalurus punctatus). Aquaculture253(1-4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NOEC	Not Reported	T	1500	NR	NR	ug/L	LAB	2006. Rabago-Castro, J.L., J.G. Sanchez, R. Perez-Castaneda, and A. Gonzalez-Gonzalez. Effects of the Prophylactic Use of Romet-30 and Copper Sulfate on Growth, Condition and Feeding Indices in Channel Catfish (Ictalurus punctatus). Aquaculture253(1-4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NOEC	Not Reported	T	1500	NR	NR	ug/L	LAB	2006. Rabago-Castro, J.L., J.G. Sanchez, R. Perez-Castaneda, and A. Gonzalez-Gonzalez. Effects of the Prophylactic Use of Romet-30 and Copper Sulfate on Growth, Condition and Feeding Indices in Channel Catfish (Ictalurus punctatus). Aquaculture253(1-4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NOEC	Not Reported	T	1500	NR	NR	ug/L	LAB	2006. Rabago-Castro, J.L., J.G. Sanchez, R. Perez-Castaneda, and A. Gonzalez-Gonzalez. Effects of the Prophylactic Use of Romet-30 and Copper Sulfate on Growth, Condition and Feeding Indices in Channel Catfish (Ictalurus punctatus). Aquaculture253(1-4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NOEC	Not Reported	T	1500	NR	NR	ug/L	LAB	2006. Rabago-Castro, J.L., J.G. Sanchez, R. Perez-Castaneda, and A. Gonzalez-Gonzalez. Effects of the Prophylactic Use of Romet-30 and Copper Sulfate on Growth, Condition and Feeding Indices in Channel Catfish (Ictalurus punctatus). Aquaculture253(1-4): 343-349.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NOEL	Not Reported	T	12	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NOEL	Not Reported	T	13	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	T	NR	NA	NR	ug/L	LAB	1997. Perkins, E.J., B. Griffin, M. Hobbs, J. Gollon, L. Wolford, and D. Schlenk. Sexual Differences in Mortality and Sublethal Stress in Channel Catfish Following a 10 Week Exposure to Copper Sulfate. Aquat. Toxicol.37: 327-339.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NR	Not Reported	T	1500	NR	NR	ug/L	LAB	2006. Rabago-Castro, J.L., J.G. Sanchez, R. Perez-Castaneda, and A. Gonzalez-Gonzalez. Effects of the Prophylactic Use of Romet-30 and Copper Sulfate on Growth, Condition and Feeding Indices in Channel Catfish (Ictalurus punctatus). Aquaculture253(1-4): 343-349.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NR		T	16000	NA	NR	ug/L	LAB	1981. Murai, T., J.W. Andrews, and R.G.,Jr. Smith. Effects of Dietary Copper on Channel Catfish. Aquaculture22(4): 353-357.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NR		T	8000	NA	NR	ug/L	LAB	1981. Murai, T., J.W. Andrews, and R.G.,Jr. Smith. Effects of Dietary Copper on Channel Catfish. Aquaculture22(4): 353-357.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NR		T	16000	NA	NR	ug/L	LAB	1981. Murai, T., J.W. Andrews, and R.G.,Jr. Smith. Effects of Dietary Copper on Channel Catfish. Aquaculture22(4): 353-357.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NR		T	8000	NA	NR	ug/L	LAB	1981. Murai, T., J.W. Andrews, and R.G.,Jr. Smith. Effects of Dietary Copper on Channel Catfish. Aquaculture22(4): 353-357.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NR		T	12	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NR		T	18	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Copper	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1362	NR	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Copper	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1503	NR	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Copper	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1603	NR	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Copper	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1657	NR	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Copper	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1878	NR	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Copper	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2436	NR	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Copper	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	51	NR	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Copper	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	65	NR	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	10800	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	113400	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	13200	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	26600	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	33300	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	33600	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3400	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4700	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	51900	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	7400	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8100	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8300	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8800	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	88700	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2600	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3100	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3700	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	6620	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1200	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1250	NR	NR	ug/L	LAB	1999. Perschbacher, P.W., and W.A. Wurts. Effects of Calcium and Magnesium Hardness on Acute Copper Toxicity to Juvenile Channel Catfish, Ictalurus punctatus. Aquaculture172: 275-280.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	13400	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	16100	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1900	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	19000	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	19000	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2200	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3100	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4300	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4700	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	5300	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	6200	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	7100	NR	NR	ug/L	LAB	2008. Straus, D.L.. Copper Sulfate Toxicity to Channel Catfish Fry: Yolk Sac Versus Swim-Up Fry. N. Am. J. Aquacult.70(3): 323-327.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	733	NA	NR	ug/L	LAB	1993. Waller, D.L., J.J. Rach, W.G. Cope, L.L. Marking, S.W. Fisher, and H. Dabrowska. Toxicity of Candidate Molluscicides to Zebra Mussels (Dreissena polymorpha) and Selected Nontarget Organisms. J. Great Lakes Res.19(4): 695-702.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1750	NR	NR	ug/L	LAB	2006. Straus, D.L.. Species Sensitivity to Copper: Acute Toxicity to Channel Catfish, Ictalurus punctatus, and Sunshine Bass, Morone chrysops x M. saxatilis. J. Appl. Aquacult.18(1): 89-99.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	710	NR	NR	ug/L	LAB	2005. Moore, J.M.. Comparison of Copper Toxicity to Channel Catfish, Ictalurus punctatus, and Blue Catfish, I. furcatus, Fingerlings. J. Appl. Aquacult.17(1): 77-84.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1041	NA	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1139	NA	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	54	NA	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	55	NA	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	762	NA	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	768	NA	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	925	NA	NR	ug/L	LAB	1993. Straus, D.L., and C.S. Tucker. Acute Toxicity of Copper Sulfate and Chelated Copper to Channel Catfish Ictalurus punctatus. J. World Aquacult. Soc.24(3): 390-395.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	7560	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	28000	NA	NR	ug/L	LAB	1994. Wurts, W.A., and P.W. Perschbacher. Effects of Bicarbonate Alkalinity and Calcium on the Acute Toxicity of Copper to Juvenile Channel Catfish (Ictalurus punctatus). Aquaculture125(1-2): 73-79.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	D	1200	NA	NR	ug/L	LAB	1978. Richey, D., and D. Roseboom. Acute Toxicity of Copper to Some Fishes in high Alkalinity Water. Circular 131, Dep.Registration & Education, State of IL: 24 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	D	1030	NA	NR	ug/L	LAB	1978. Richey, D., and D. Roseboom. Acute Toxicity of Copper to Some Fishes in high Alkalinity Water. Circular 131, Dep.Registration & Education, State of IL: 24 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	D	1180	NA	NR	ug/L	LAB	1978. Richey, D., and D. Roseboom. Acute Toxicity of Copper to Some Fishes in high Alkalinity Water. Circular 131, Dep.Registration & Education, State of IL: 24 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LOEC	Not Reported	T	1000	NR	NR	ug/L	FIELDU	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LOEC	Not Reported	T	690	NR	NR	ug/L	LAB	2006. Straus, D.L.. Species Sensitivity to Copper: Acute Toxicity to Channel Catfish, Ictalurus punctatus, and Sunshine Bass, Morone chrysops x M. saxatilis. J. Appl. Aquacult.18(1): 89-99.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LOEC	Not Reported	T	1250	NR	NR	ug/L	LAB	1999. Perschbacher, P.W., and W.A. Wurts. Effects of Calcium and Magnesium Hardness on Acute Copper Toxicity to Juvenile Channel Catfish, Ictalurus punctatus. Aquaculture172: 275-280.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LOEC	Not Reported	T	1250	NR	NR	ug/L	LAB	1999. Perschbacher, P.W., and W.A. Wurts. Effects of Calcium and Magnesium Hardness on Acute Copper Toxicity to Juvenile Channel Catfish, Ictalurus punctatus. Aquaculture172: 275-280.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LOEC	Not Reported	T	1250	NR	NR	ug/L	LAB	1999. Perschbacher, P.W., and W.A. Wurts. Effects of Calcium and Magnesium Hardness on Acute Copper Toxicity to Juvenile Channel Catfish, Ictalurus punctatus. Aquaculture172: 275-280.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LOEL	Not Reported	T	18	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LOEL	Not Reported	T	19	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	MATC	Not Reported	D	3600	NR	NR	ug/L	LAB	1997. Griffin, B.R., M.S. Hobbs, J.L. Gollon, D. Schlenk, F.F. Kadlubar, and C.D. Brand. Effect of Waterborne Copper Sulfate Exposure on Copper Content in Liver and Axial Muscle of Channel Catfish. J. Aquat. Anim. Health9: 144-150.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NOEC	Not Reported	T	1000	NR	NR	ug/L	FIELDU	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NOEC	Not Reported	T	1000	NR	NR	ug/L	FIELDU	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NOEC	Not Reported	T	480	NR	NR	ug/L	LAB	2006. Straus, D.L.. Species Sensitivity to Copper: Acute Toxicity to Channel Catfish, Ictalurus punctatus, and Sunshine Bass, Morone chrysops x M. saxatilis. J. Appl. Aquacult.18(1): 89-99.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NOEC	Not Reported	T	1250	NR	NR	ug/L	LAB	1999. Perschbacher, P.W., and W.A. Wurts. Effects of Calcium and Magnesium Hardness on Acute Copper Toxicity to Juvenile Channel Catfish, Ictalurus punctatus. Aquaculture172: 275-280.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NOEC	Not Reported	T	1250	NR	NR	ug/L	LAB	1999. Perschbacher, P.W., and W.A. Wurts. Effects of Calcium and Magnesium Hardness on Acute Copper Toxicity to Juvenile Channel Catfish, Ictalurus punctatus. Aquaculture172: 275-280.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NOEL	Not Reported	T	12	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NOEL	Not Reported	T	13	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Phelps, R.P.. Toxicity and Efficacy of Five Chemotherapeutics Used in Aquaculture when Applied to Waters of Different Quality. Ph.D.Thesis, Auburn Univ., Auburn, AL: 103 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	28000	NA	NR	ug/L	LAB	1994. Wurts, W.A., and P.W. Perschbacher. Effects of Bicarbonate Alkalinity and Calcium on the Acute Toxicity of Copper to Juvenile Channel Catfish (Ictalurus punctatus). Aquaculture125(1-2): 73-79.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Perkins, E.J., B. Griffin, M. Hobbs, J. Gollon, L. Wolford, and D. Schlenk. Sexual Differences in Mortality and Sublethal Stress in Channel Catfish Following a 10 Week Exposure to Copper Sulfate. Aquat. Toxicol.37: 327-339.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	1250	NR	NR	ug/L	LAB	1999. Perschbacher, P.W., and W.A. Wurts. Effects of Calcium and Magnesium Hardness on Acute Copper Toxicity to Juvenile Channel Catfish, Ictalurus punctatus. Aquaculture172: 275-280.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	13	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	19	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1250	NR	NR	ug/L	LAB	1999. Perschbacher, P.W., and W.A. Wurts. Effects of Calcium and Magnesium Hardness on Acute Copper Toxicity to Juvenile Channel Catfish, Ictalurus punctatus. Aquaculture172: 275-280.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1250	NR	NR	ug/L	LAB	1999. Perschbacher, P.W., and W.A. Wurts. Effects of Calcium and Magnesium Hardness on Acute Copper Toxicity to Juvenile Channel Catfish, Ictalurus punctatus. Aquaculture172: 275-280.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	34	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	28000	NA	NR	ug/L	LAB	1994. Wurts, W.A., and P.W. Perschbacher. Effects of Bicarbonate Alkalinity and Calcium on the Acute Toxicity of Copper to Juvenile Channel Catfish (Ictalurus punctatus). Aquaculture125(1-2): 73-79.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	28000	NA	NR	ug/L	LAB	1994. Wurts, W.A., and P.W. Perschbacher. Effects of Bicarbonate Alkalinity and Calcium on the Acute Toxicity of Copper to Juvenile Channel Catfish (Ictalurus punctatus). Aquaculture125(1-2): 73-79.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	20000		NC	ug/L	LAB	1989. Gatlin III, D.M., H.F. Phillips, and E.L. Torrans. Effects of Various Levels of Dietary Copper and Zinc on Channel Catfish. Aquaculture76(1-2): 127-134.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Perkins, E.J., B. Griffin, M. Hobbs, J. Gollon, L. Wolford, and D. Schlenk. Sexual Differences in Mortality and Sublethal Stress in Channel Catfish Following a 10 Week Exposure to Copper Sulfate. Aquat. Toxicol.37: 327-339.
Sulfuric acid copper(2+) salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1250	NR	NR	ug/L	LAB	1999. Perschbacher, P.W., and W.A. Wurts. Effects of Calcium and Magnesium Hardness on Acute Copper Toxicity to Juvenile Channel Catfish, Ictalurus punctatus. Aquaculture172: 275-280.
Sulfuric acid copper(2+) salt (1:1)	Characin	Fish	Fresh	Mortality	LC50	Not Reported	T	200		NC	ug/L	LAB	2007. Gioda, C.R., L.A. Lissner, A. Pretto, J.B.T. Da Rocha, M.R.C. Schetinger, J.R. Neto, V.M. Morsch, and V.L. Loro. Exposure to Sublethal Concentrations of Zn(II) and Cu(II) Changes Biochemical Parameters in Leporinus obtusidens. Chemosphere69(1): 170-175.
Sulfuric acid copper(2+) salt (1:1)	Characin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	40		NC	ug/L	LAB	2007. Gioda, C.R., L.A. Lissner, A. Pretto, J.B.T. Da Rocha, M.R.C. Schetinger, J.R. Neto, V.M. Morsch, and V.L. Loro. Exposure to Sublethal Concentrations of Zn(II) and Cu(II) Changes Biochemical Parameters in Leporinus obtusidens. Chemosphere69(1): 170-175.
Sulfuric acid copper(2+) salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	480	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid copper(2+) salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid copper(2+) salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid copper(2+) salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Copper	Cherry Salmon	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Copper	Cherry Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Copper	Cherry Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Copper	Cherry Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Copper	Chinook Salmon	Fish	Fresh	Growth	LOEC	Not Reported	D	7.4	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Copper	Chinook Salmon	Fish	Fresh	Growth	LOEC	Not Reported	D	7.4	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	11.1	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	12.2	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	16.1	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	22.6	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	3.8	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	36.7	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	7.3	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	7.7	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	9.6	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	12.1	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	19.9	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	3.9	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	36.5	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	5.9	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	7.2	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	8.4	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	8.8	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC20	Not Reported	D	9.4	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	1977. Chapman, G.A., and J.K. McCrady. Copper Toxicity: A Question of Form. In: R.A.Tubb, (Ed.), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium held in Corvallis, Oregon, Jan.13-14, 1977, Oregon State Univ., U.S.EPA, Corvallis, OR: 132-151.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	33.1	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	101	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	12.5	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	14.3	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	18.3	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	18.5	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	41.1	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	46	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	7.4	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	38	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	11.9	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	13.6	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	14.9	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	16.6	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	18.2	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	27.6	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	36.4	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	45.7	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	7	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	145	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	78	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	81	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	32	NA	NR	ug/L	LAB	1982. Finlayson, B.J., and K.M. Verrue. Toxicities of Copper, Zinc, and Cadmium Mixtures to Juvenile Chinook Salmon. Trans. Am. Fish. Soc.111(5): 645-650.
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	54	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	58	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LD1	Not Reported	T	18000		NC	ug/L	LAB	2008. Taylor, P.W., and R.A. Glenn. Toxicity of Five Therapeutic Compounds on Juvenile Salmonids. N. Am. J. Aquacult.70(2): 175-183.
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LD1	Not Reported	T	3000		NC	ug/L	LAB	2008. Taylor, P.W., and R.A. Glenn. Toxicity of Five Therapeutic Compounds on Juvenile Salmonids. N. Am. J. Aquacult.70(2): 175-183.
Nitric acid, Copper(2+) salt	Chinook Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	190	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Nitric acid, Copper(2+) salt	Chinook Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	178	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	31000		NC	ug/L	LAB	2008. Taylor, P.W., and R.A. Glenn. Toxicity of Five Therapeutic Compounds on Juvenile Salmonids. N. Am. J. Aquacult.70(2): 175-183.
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	36000		NC	ug/L	LAB	2008. Taylor, P.W., and R.A. Glenn. Toxicity of Five Therapeutic Compounds on Juvenile Salmonids. N. Am. J. Aquacult.70(2): 175-183.
Copper	Chinook Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	D	15.5	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Nitric acid, Copper(2+) salt	Chinook Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	178	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Copper(2+) salt	Chinook Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	178	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Nitric acid, Copper(2+) salt	Chinook Salmon	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Nitric acid, Copper(2+) salt	Chinook Salmon	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Copper	Chinook Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	D	11.7	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Nitric acid, Copper(2+) salt	Chinook Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Nitric acid, Copper(2+) salt	Chinook Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	5000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Nitric acid, Copper(2+) salt	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Nitric acid, Copper(2+) salt	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	3000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	4000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	5000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Sulfuric acid copper(2+) salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	174	NA	NR	ug/L	LAB	1970. Hazel, C.R., and S.J. Meith. Bioassay of King Salmon Eggs and Sac Fry in Copper Solutions. Calif. Fish Game56(2): 121-124.
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	41.2	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	53.8	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	63.9	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chinook Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	77.4	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Chiselmouth	Fish	Fresh	Mortality	LC50	Not Reported	T	143	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Sulfuric acid copper(2+) salt (1:1)	Chub	Fish	Fresh	Growth	NR		T	130*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Chub	Fish	Fresh	Growth	NR		T	64*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Chub	Fish	Fresh	Reproduction	LOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Chub	Fish	Fresh	Reproduction	NOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid copper(2+) salt (1:1)	Chub	Fish	Fresh	Reproduction	NOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid copper(2+) salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC10	Not Reported	T	1000		NR	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid copper(2+) salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid copper(2+) salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid copper(2+) salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	1400		NR	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid copper(2+) salt (1:1)	Climbing Perch	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1989. Jana, S., and S.S. Sahana. Sensitivity of the Freshwater Fishes Clarias batrachus and Anabas testudineus to Heavy Metals. Environ. Ecol.7(2): 265-270.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Growth	NOEC	Not Reported	T	22	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	T	21	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	T	28	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Lorz, H.W., and B.P. McPherson. Effects of Copper and Zinc on Smoltification of Coho Salmon. EPA-600/3-77-032, U.S.EPA, Corvallis, OR: 69 p..
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	103	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	61	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	63	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	81	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	85	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	86	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	164	D	17	ug/L	LAB	1983. Buckley, J.A.. Complexation of Copper in the Effluent of a Sewage Treatment Plant and an Estimate of Its Influence on Toxicity to Coho Salmon. Water Res.17(12): 1929-1934.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	39	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	61	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	61	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	61	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	62	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	65	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	69	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	69	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	72	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	74	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	77	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	82	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	84	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	84	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	150		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	166		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	192		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	212		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	60		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	81		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Copper chloride	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	45	NA	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	46	NR	NR	ug/L	LAB	1978. Chapman, G.A., and D.G. Stevens. Acutely Lethal Levels of Cadmium, Copper, and Zinc to Adult Male Coho Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 837-840.
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1977. Lorz, H.W., and B.P. McPherson. Effects of Copper and Zinc on Smoltification of Coho Salmon. EPA-600/3-77-032, U.S.EPA, Corvallis, OR: 69 p..
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1977. Lorz, H.W., and B.P. McPherson. Effects of Copper and Zinc on Smoltification of Coho Salmon. EPA-600/3-77-032, U.S.EPA, Corvallis, OR: 69 p..
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	74	NA	NR	ug/L	LAB	1977. Lorz, H.W., and B.P. McPherson. Effects of Copper and Zinc on Smoltification of Coho Salmon. EPA-600/3-77-032, U.S.EPA, Corvallis, OR: 69 p..
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1976. Lorz, H.W., and B.P. McPherson. Effects of Copper or Zinc in Fresh Water or the Adaptation to Sea Water and ATPase Activity and the Effects of Copper on Migratory Disposition of Coho Salmon (Oncorhynchus kisutch). J. Fish. Res. Board Can.33(9): 2023-2030.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1976. Lorz, H.W., and B.P. McPherson. Effects of Copper or Zinc in Fresh Water or the Adaptation to Sea Water and ATPase Activity and the Effects of Copper on Migratory Disposition of Coho Salmon (Oncorhynchus kisutch). J. Fish. Res. Board Can.33(9): 2023-2030.
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	74	NA	NR	ug/L	LAB	1976. Lorz, H.W., and B.P. McPherson. Effects of Copper or Zinc in Fresh Water or the Adaptation to Sea Water and ATPase Activity and the Effects of Copper on Migratory Disposition of Coho Salmon (Oncorhynchus kisutch). J. Fish. Res. Board Can.33(9): 2023-2030.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	23.4	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	44.2	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	57	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	62.3	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	15.1	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	19.3	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	21	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	23.9	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	31.9	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LD1	Not Reported	T	13000		NC	ug/L	LAB	2008. Taylor, P.W., and R.A. Glenn. Toxicity of Five Therapeutic Compounds on Juvenile Salmonids. N. Am. J. Aquacult.70(2): 175-183.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	30000		NC	ug/L	LAB	2008. Taylor, P.W., and R.A. Glenn. Toxicity of Five Therapeutic Compounds on Juvenile Salmonids. N. Am. J. Aquacult.70(2): 175-183.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	51000		NC	ug/L	LAB	2008. Taylor, P.W., and R.A. Glenn. Toxicity of Five Therapeutic Compounds on Juvenile Salmonids. N. Am. J. Aquacult.70(2): 175-183.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	370	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	190	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	280	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	440	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	460	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	480	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LD50	Not Reported	T	360	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	500	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	205	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	354	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	410	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	500	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	T	500	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	18	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	24	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	282	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	150	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	199	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	370	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	370	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	T	282	NR	NR	ug/L	LAB	1960. Holland, G.A., J.E. Lasater, E.D. Neumann, and W.E. Eldridge. Toxic Effects of Organic and Inorganic Pollutants on Young Salmon and Trout. Res.Bull.No.5, State of Washington Dept.Fish., Seattle, WA: 263 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	5000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Nitric acid, Copper(2+) salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	3000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	4000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Sulfuric acid copper(2+) salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	5000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Copper	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	16.8	NR	NR	ug/L	LAB	2004. Sandahl, J.. Biochemical and Physiological Indicators of Behavioral Impairment in Salmonids Exposed to Chlorpyrifos and Copper. Ph.D Thesis, Oregon State University,OR: 140 p..
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	76.1	NR	NR	ug/L	LAB	1978. Schreck, C.B., and H.W. Lorz. Stress Response of Coho Salmon (Oncorhynchus kisutch) Elicited by Cadmium and Copper and Potential Use of Cortisol as an Indicator of Stress. J. Fish. Res. Board Can.35(8): 1124-1129.
Copper chloride (CuCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	76.1	NR	NR	ug/L	LAB	1978. Schreck, C.B., and H.W. Lorz. Stress Response of Coho Salmon (Oncorhynchus kisutch) Elicited by Cadmium and Copper and Potential Use of Cortisol as an Indicator of Stress. J. Fish. Res. Board Can.35(8): 1124-1129.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	690	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	293	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	460	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	640	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	890	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	293	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	570	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	293	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	390	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	293	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	380	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	430	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	430	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	480	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	363	NA	NR	ug/L	LAB	1996. Buhl, K.J., and S.J. Hamilton. Toxicity of Inorganic Contaminants, Individually and in Environmental Mixtures, to Three Endangered Fishes (Colorado Squawfish, Bonytail, and Razorback Sucker). Arch. Environ. Contam. Toxicol.30(1): 84-92.
Sulfuric acid copper(2+) salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	663	NA	NR	ug/L	LAB	1996. Buhl, K.J., and S.J. Hamilton. Toxicity of Inorganic Contaminants, Individually and in Environmental Mixtures, to Three Endangered Fishes (Colorado Squawfish, Bonytail, and Razorback Sucker). Arch. Environ. Contam. Toxicol.30(1): 84-92.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Growth	LOEL	Egg	T	100	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Growth	LOEL	Egg	T	100	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Growth	LOEL	Egg	T	100	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Growth	NOEL	Egg	T	50	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1996. Stouthart, X.J.H.X., J.L.M. Haans, R.A.C. Lock, and S.E. Wendelaar Bonga. Effects of Water pH on Copper Toxicity to Early Life Stages of the Common Carp (Cyprinus carpio). Environ. Toxicol. Chem.15(3): 376-383.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	uM	LAB	1997. De Boeck, G., A. Vlaeminck, and R. Blust. Effects of Sublethal Copper Exposure on Copper Accumulation, Food Consumption, Growth, Energy Stores, and Nucleic Acid Content in Common Carp. Arch. Environ. Contam. Toxicol.33(4): 415-422.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Growth	NR	Whole Organism	T	100	NR	NR	ug/L	LAB	2001. De Boeck, G., A. Vlaeminck, P.H.M. Balm, R.A.C. Lock, B. De Wachter, and R. Blust. Morphological and Metabolic Changes in Common Carp, Cyprinus carpio, During Short-Term Copper Exposure: Interactions Between Cu2+ and Plasma Cortisol Elevation. Environ. Toxicol. Chem.20(2): 374-381.
Copper	Common Carp	Fish	Fresh	Mortality	LC5	Not Reported	T	8000	NR	NR	ug/L	LAB	1986. Wani, G.P.. Toxicity of Heavy Metals to Embryonic Stages of Cyprinus carpio communis Linn. Pollut. Res.5(2): 47-51.
Copper	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	NR	NR	ug/L	LAB	1961. Fujiya, M.. Use of Electrophoretic Serum Separation in Fish Studies. J. Water Pollut. Control Fed.33(3): 250-257.
Copper	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1998. Lam, K.L., P.W. Ko, J.K.Y. Wong, and K.M. Chan. Metal Toxicity and Metallothionein Gene Expression Studies in Common Carp and Tilapia. Mar. Environ. Res.46(1-5): 563-566.
Copper	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1900	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Copper	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Copper	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	1998. Lam, K.L., P.W. Ko, J.K.Y. Wong, and K.M. Chan. Metal Toxicity and Metallothionein Gene Expression Studies in Common Carp and Tilapia. Mar. Environ. Res.46(1-5): 563-566.
Copper	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1207	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	656	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	562	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	479	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	444	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	384	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	370	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	738	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	311	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	540	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	558	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	386	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	252	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	215	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	186	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	157	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	122	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	119	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	118	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1981. Harrison, F.L.,Jr., and D.W.,Jr. Rice. The Sensitivity of Adult, Embryonic, and Larval Carp Cyprinus carpio to Copper. UCRL-52726, U.S.Nuclear Regulatory Commission, Lawrence Livermore Lab., Livermore, CA: 36 p..
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	115	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Study of Accumulation of Copper by Carp (Cyprinus carpio L.) - Adaptation Analysis of Bioconcentration by the Gills. Environ. Technol.12: 169-177.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	275	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Study of Accumulation of Copper by Carp (Cyprinus carpio L.) - Adaptation Analysis of Bioconcentration by the Gills. Environ. Technol.12: 169-177.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Study of Accumulation of Copper by Carp (Cyprinus carpio L.) - Adaptation Analysis of Bioconcentration by the Gills. Environ. Technol.12: 169-177.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	105	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	105	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	115	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	115	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	135	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	275	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	275	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	275	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	315	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	325	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	470	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	475	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	765	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	835	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	850	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	930	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	955	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4.34	NR	NR	uM	LAB	2008. Hashemi, S., R. Blust, and G. De Boeck. The Effect of Starving and Feeding on Copper Toxicity and Uptake in Cu Acclimated and Non-Acclimated Carp. Aquat. Toxicol.86(2): 142-147.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	5.01	NR	NR	uM	LAB	2008. Hashemi, S., R. Blust, and G. De Boeck. The Effect of Starving and Feeding on Copper Toxicity and Uptake in Cu Acclimated and Non-Acclimated Carp. Aquat. Toxicol.86(2): 142-147.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	8.46	NR	NR	uM	LAB	2008. Hashemi, S., R. Blust, and G. De Boeck. The Effect of Starving and Feeding on Copper Toxicity and Uptake in Cu Acclimated and Non-Acclimated Carp. Aquat. Toxicol.86(2): 142-147.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	9.2	NR	NR	uM	LAB	2008. Hashemi, S., R. Blust, and G. De Boeck. The Effect of Starving and Feeding on Copper Toxicity and Uptake in Cu Acclimated and Non-Acclimated Carp. Aquat. Toxicol.86(2): 142-147.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	560		NC	ug/L	LAB	1984. Cha, S.S., and J.H. Shim. Toxicity of Heavy Metal Ions on Carp (Cyprinus carpio) Eggs. Proc.Coll.Nat.Sci.(Seoul)9(2): 151-156.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	164	NA	NR	ug/L	LAB	1983. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and the Biosphere" -Studies on Sikkim Himalayas. Part 1: Acute Toxicity of Copper and Zinc to Common Carp Cyprinus carpio (Linn.) in Soft Water. Acta Hydrochim. Hydrobiol.11(6): 667-673.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	340*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and the Biosphere" -Studies on Sikkim Himalayas. Part 1: Acute Toxicity of Copper and Zinc to Common Carp Cyprinus carpio (Linn.) in Soft Water. Acta Hydrochim. Hydrobiol.11(6): 667-673.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 2: Acute Toxicity of Mixed Copper-Zinc Solutions on Common Carp, Cyprinus carpio (Linn.). Acta Hydrochim. Hydrobiol.12(2): 131-135.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	260*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	95	NA	NR	ug/L	LAB	1983. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and the Biosphere" -Studies on Sikkim Himalayas. Part 1: Acute Toxicity of Copper and Zinc to Common Carp Cyprinus carpio (Linn.) in Soft Water. Acta Hydrochim. Hydrobiol.11(6): 667-673.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NR	NR	ug/L	LAB	1998. Karan, V., S. Vitorovic, V. Tutundzic, and V. Poleksic. Functional Enzymes Activity and Gill Histology of Carp After Copper Sulfate Exposure and Recovery. Ecotoxicol. Environ. Saf.40(1-2): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NR	NR	ug/L	LAB	1998. Karan, V., S. Vitorovic, V. Tutundzic, and V. Poleksic. Functional Enzymes Activity and Gill Histology of Carp After Copper Sulfate Exposure and Recovery. Ecotoxicol. Environ. Saf.40(1-2): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	95	NA	NR	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 2: Acute Toxicity of Mixed Copper-Zinc Solutions on Common Carp, Cyprinus carpio (Linn.). Acta Hydrochim. Hydrobiol.12(2): 131-135.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NR	NR	ug/L	LAB	1997. Gopal, V., S. Parvathy, and P.R. Balasubramanian. Effect of Heavy Metals on the Blood Protein Biochemistry of the Fish Cyprinus carpio and Its Use as a Bio-Indicator of Pollution Stress. Environ. Monit. Assess.48: 117-124.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	84	NA	NR	ug/L	LAB	1983. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and the Biosphere" -Studies on Sikkim Himalayas. Part 1: Acute Toxicity of Copper and Zinc to Common Carp Cyprinus carpio (Linn.) in Soft Water. Acta Hydrochim. Hydrobiol.11(6): 667-673.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	170*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	63	NA	NR	ug/L	LAB	1983. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and the Biosphere" -Studies on Sikkim Himalayas. Part 1: Acute Toxicity of Copper and Zinc to Common Carp Cyprinus carpio (Linn.) in Soft Water. Acta Hydrochim. Hydrobiol.11(6): 667-673.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1.5	NA	NR	ug/L	LAB	1981. Verma, S.R., I.P. Tonk, and R.C. Dalela. Determination of the Maximum Acceptable Toxicant Concentration (MATC) and the Safe Concentration for Certain Aquatic Pollutants. Acta Hydrochim. Hydrobiol.9(3): 247-254.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NR	NR	ug/L	LAB	2005. Das, B.K., and N. Das. Impacts of Quicklime (CaO) on the Toxicity of Copper (CuSO4, 5H2O) to Fish and Fish Food Organisms. Chemosphere61(2): 186-191.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	5450	NR	NR	ug/L	LAB	1998. Karan, V., S. Vitorovic, V. Tutundzic, and V. Poleksic. Functional Enzymes Activity and Gill Histology of Carp After Copper Sulfate Exposure and Recovery. Ecotoxicol. Environ. Saf.40(1-2): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	640	NR	NR	ug/L	LAB	1998. Karan, V., S. Vitorovic, V. Tutundzic, and V. Poleksic. Functional Enzymes Activity and Gill Histology of Carp After Copper Sulfate Exposure and Recovery. Ecotoxicol. Environ. Saf.40(1-2): 49-55.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	160000*	NA	NR	ug/L	LAB	1980. Deshmukh, S.S., and V.B. Marathe. Size Related Toxicity of Copper and Mercury to Lebistes reticulatus (Peter), Labeo rohita (Ham.) and Cyprinus carpio Linn. Indian J. Exp. Biol.18: 421-423.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	34500*	NA	NR	ug/L	LAB	1980. Deshmukh, S.S., and V.B. Marathe. Size Related Toxicity of Copper and Mercury to Lebistes reticulatus (Peter), Labeo rohita (Ham.) and Cyprinus carpio Linn. Indian J. Exp. Biol.18: 421-423.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	NR	Mortality	LC50	Not Reported	T	380*	NA	NR	ug/L	LAB	1980. Svobodova, Z.. Acute Toxicity of Pesticides to Fish (Akutni Toxicita Pesticidu pro Ryby). Agrochemia (Bratisl.)20(11): 328-332.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50*	Not Reported	T	2100	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50*	Not Reported	T	1000	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	LC50*	Not Reported	T	810	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LOEL	Not Reported	T	100	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	MATC	Not Reported	T	14.5	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	MATC	Not Reported	T	37.5	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	MATC	Not Reported	T	6	NA	NR	ug/L	LAB	1991. Peres, I., and J.C. Pihan. Copper LC50 to Cyprinus carpio. Influence of Hardness, Seasonal Variation, Proposition of Maximum Acceptable Toxicant Concentration. Environ. Technol.12(2): 161-167.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NOEL	Not Reported	T	50	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NOEL	Not Reported	T	100	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Copper chloride (CuCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Wong, M.H., K.C. Luk, and K.Y. Choi. The Effects of Zinc and Copper Salts on Cyprinus carpio and Ctenopharyngodon idellus. Acta Anat.99(4): 450-454.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1996. Stouthart, X.J.H.X., J.L.M. Haans, R.A.C. Lock, and S.E. Wendelaar Bonga. Effects of Water pH on Copper Toxicity to Early Life Stages of the Common Carp (Cyprinus carpio). Environ. Toxicol. Chem.15(3): 376-383.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1996. Stouthart, X.J.H.X., J.L.M. Haans, R.A.C. Lock, and S.E. Wendelaar Bonga. Effects of Water pH on Copper Toxicity to Early Life Stages of the Common Carp (Cyprinus carpio). Environ. Toxicol. Chem.15(3): 376-383.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T		NR	NR	ug/L	LAB	1986. Wani, G.P.. Toxicity of Heavy Metals to Embryonic Stages of Cyprinus carpio communis Linn. Pollut. Res.5(2): 47-51.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T		NR	NR	ug/L	LAB	1986. Wani, G.P.. Toxicity of Heavy Metals to Embryonic Stages of Cyprinus carpio communis Linn. Pollut. Res.5(2): 47-51.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	700	NA	NR	ug/L	LAB	1978. Hildebrand, S.G., and R.M. Cushman. Toxicity of Gallium and Beryllium to Developing Carp Eggs (Cyprinus carpio) Utilizing Copper as a Reference. Toxicol. Lett.2(2): 91-95.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	90	NA	NR	ug/L	LAB	1978. Hildebrand, S.G., and R.M. Cushman. Toxicity of Gallium and Beryllium to Developing Carp Eggs (Cyprinus carpio) Utilizing Copper as a Reference. Toxicol. Lett.2(2): 91-95.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1982. Muramoto, S.. Effects of Complexans (DTPA, EDTA) on the Toxicity of Low Concentrations of Copper to Fish. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control17(3): 313-319.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	50	NA	NR	ug/L	LAB	1982. Muramoto, S.. Effects of Complexans (DTPA, EDTA) on the Toxicity of Low Concentrations of Copper to Fish. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control17(3): 313-319.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1982. Muramoto, S.. Effects of Complexans (DTPA, EDTA) on the Toxicity of Low Concentrations of Copper to Fish. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control17(3): 313-319.
Copper	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Copper	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1500	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1991. Marek, J., E. Szulkowska-Wojaczek, and Z. Czarna. The Effect of Copper (Cu2+) on Carp (Cyprinus carpio L.) Juveniles in a Laboratory Experiment. Pol. Arch. Hydrobiol.38(3-4): 485-494.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	400	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	600	NA	NR	ug/L	LAB	1980. Muramoto, S.. Effect of Complexans (EDTA, NTA and DTPA) on the Exposure to high Concentrations of Cadmium, Copper, Zinc and Lead. Bull. Environ. Contam. Toxicol.25(6): 941-946.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	NR	Mortality	NR-LETH	Not Reported	T	64000	NA	NR	ug/L	LAB	1960. Turoboyski, L.. Attempt to Determine the Influence of high Doses of Some Chemical Compounds upon Carp Fry (Proba Okreslenia Wplywu Wysokich Dawek Niektorych Zwiazkow Chemicznych na Narybek Karpia). Rocz. Nauk Roln.75B(3): 401-445.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3.5	NR	NR	uM	LAB	2008. Hashemi, S., R. Blust, and G. De Boeck. The Effect of Starving and Feeding on Copper Toxicity and Uptake in Cu Acclimated and Non-Acclimated Carp. Aquat. Toxicol.86(2): 142-147.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	6	NR	NR	uM	LAB	2008. Hashemi, S., R. Blust, and G. De Boeck. The Effect of Starving and Feeding on Copper Toxicity and Uptake in Cu Acclimated and Non-Acclimated Carp. Aquat. Toxicol.86(2): 142-147.
Nitric acid, Copper(2+) salt	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	2001. De Boeck, G., A. Vlaeminck, P.H.M. Balm, R.A.C. Lock, B. De Wachter, and R. Blust. Morphological and Metabolic Changes in Common Carp, Cyprinus carpio, During Short-Term Copper Exposure: Interactions Between Cu2+ and Plasma Cortisol Elevation. Environ. Toxicol. Chem.20(2): 374-381.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NA	NR	ug/L	LAB	1991. Marek, J., E. Szulkowska-Wojaczek, and Z. Czarna. The Effect of Copper (Cu2+) on Carp (Cyprinus carpio L.) Juveniles in a Laboratory Experiment. Pol. Arch. Hydrobiol.38(3-4): 485-494.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	4		NR	ug/L	LAB	2001. Dhanapakiam, P., and V.K. Ramasamy. Toxic Effects of Copper and Zinc Mixtures on Some Haematological and Biochemical Parameters in Common Carp, Cyprinus carpio (Linn.). J. Environ. Biol.22(2): 105-111.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Reproduction	LOEL	Sperm	T	300	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Reproduction	LOEL	Sperm	T	500	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Reproduction	NOEL	Sperm	T	100	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Sulfuric acid copper(2+) salt (1:1)	Common Carp	Fish	Fresh	Reproduction	NOEL	Sperm	T	50	NR	NR	ug/L	LAB	1997. Jezierska, B., and I. Slominska. The Effect of Copper on Common Carp (Cyprinus carpio L.) During Embryonic and Postembryonic Development. Pol. Arch. Hydrobiol.44(1/2): 261-272.
Sulfuric acid copper(2+) salt (1:1)	Common Eel	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Grosell, M., I. Boetius, H.J.M. Hansen, and P. Rosenkilde. Influence of Preexposure to Sublethal Levels of Copper on 64Cu Uptake and Distribution Among Tissues of the European Eel (Anguilla anguilla). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.114(3): 229-235.
Sulfuric acid copper(2+) salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	88	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	76	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Nitric acid, Copper(2+) salt	Convict Or Zebra Cichlid	Fish	Fresh	Growth	NR		T	16	NA	NR	ug/L	LAB	1979. Ozoh, P.T.E., and C.O. Jacobson. Embryotoxicity and Hatchability in Cichlasoma nigrofasciatum (Guenther) Eggs and Larvae Briefly Exposed to Low Concentrations of Zinc and Copper. Bull. Environ. Contam. Toxicol.21(6): 782-786.
Nitric acid, Copper(2+) salt	Convict Or Zebra Cichlid	Fish	Fresh	Mortality	NR	Not Reported	T	16	NA	NR	ug/L	LAB	1979. Ozoh, P.T.E., and C.O. Jacobson. Embryotoxicity and Hatchability in Cichlasoma nigrofasciatum (Guenther) Eggs and Larvae Briefly Exposed to Low Concentrations of Zinc and Copper. Bull. Environ. Contam. Toxicol.21(6): 782-786.
Sulfuric acid copper(2+) salt (1:1)	Creek Chub	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	D	340	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Creek Chub	Fish	Fresh	Mortality	LC50	Not Reported	T	9600	D	850	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Creek Chub	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	D	340	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Creek Chub	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	D	1000	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Creek Chub	Fish	Fresh	Mortality	LC50	Not Reported	T	370	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Creek Chub	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	D	340	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Creek Chub	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	D	1000	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Creek Chub	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR	Not Reported	T	130*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1200000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	610000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	310000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	150000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	38000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	15000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	7700*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4100*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	770*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	510*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	260*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Crucian Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1500*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Curimbata	Fish	Fresh	Mortality	NR	Not Reported	T	16	NR	NR	ug/L	LAB	2008. Carvalho, C.S., and M.N. Fernandes. Effect of Copper on Liver Key Enzymes of Anaerobic Glucose Metabolism from Freshwater Tropical Fish Prochilodus lineatus. Comp. Biochem. Physiol. A Physiol.151(3): 437-442.
Sulfuric acid copper(2+) salt (1:1)	Curimbata	Fish	Fresh	Mortality	NR	Not Reported	T	88	NR	NR	ug/L	LAB	2008. Carvalho, C.S., and M.N. Fernandes. Effect of Copper on Liver Key Enzymes of Anaerobic Glucose Metabolism from Freshwater Tropical Fish Prochilodus lineatus. Comp. Biochem. Physiol. A Physiol.151(3): 437-442.
Sulfuric acid copper(2+) salt (1:1)	Curimbata	Fish	Fresh	Mortality	NR	Not Reported	T	88	NR	NR	ug/L	LAB	2008. Carvalho, C.S., and M.N. Fernandes. Effect of Copper on Liver Key Enzymes of Anaerobic Glucose Metabolism from Freshwater Tropical Fish Prochilodus lineatus. Comp. Biochem. Physiol. A Physiol.151(3): 437-442.
Sulfuric acid copper(2+) salt (1:1)	Curimbata	Fish	Fresh	Mortality	NR	Not Reported	T	98	NR	NR	ug/L	LAB	2008. Carvalho, C.S., and M.N. Fernandes. Effect of Copper on Liver Key Enzymes of Anaerobic Glucose Metabolism from Freshwater Tropical Fish Prochilodus lineatus. Comp. Biochem. Physiol. A Physiol.151(3): 437-442.
Copper chloride (CuCl)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	117	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	186	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	198	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	21.2	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	283	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	399	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	41.4	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	56	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	85.6	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl2)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15.7	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	162	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	186	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	232	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	36.8	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	367	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	44.4	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	73.6	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	91	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Sulfuric acid copper(2+) salt (1:1)	Cyprinid	Fish	Fresh	Mortality	LC50	Not Reported	T	246		NC	ug/L	LAB	2000. Shyong, W.J., and H.C. Chen. Acute Toxicity of Copper, Cadmium, and Mercury to the Freshwater Fish Varicorhinus barbatus and Zacco barbata. Acta Zool. Taiwanica11(1): 33-45.
Sulfuric acid copper(2+) salt (1:1)	Cyprinid	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	400		NC	ug/L	LAB	2000. Shyong, W.J., and H.C. Chen. Acute Toxicity of Copper, Cadmium, and Mercury to the Freshwater Fish Varicorhinus barbatus and Zacco barbata. Acta Zool. Taiwanica11(1): 33-45.
Sulfuric acid copper(2+) salt (1:1)	Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	79		NC	ug/L	LAB	2000. Shyong, W.J., and H.C. Chen. Acute Toxicity of Copper, Cadmium, and Mercury to the Freshwater Fish Varicorhinus barbatus and Zacco barbata. Acta Zool. Taiwanica11(1): 33-45.
Sulfuric acid copper(2+) salt (1:1)	Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	1420	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Dace	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	150		NC	ug/L	LAB	2000. Shyong, W.J., and H.C. Chen. Acute Toxicity of Copper, Cadmium, and Mercury to the Freshwater Fish Varicorhinus barbatus and Zacco barbata. Acta Zool. Taiwanica11(1): 33-45.
Sulfuric acid copper(2+) salt (1:1)	Dace	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	70		NC	ug/L	LAB	2000. Shyong, W.J., and H.C. Chen. Acute Toxicity of Copper, Cadmium, and Mercury to the Freshwater Fish Varicorhinus barbatus and Zacco barbata. Acta Zool. Taiwanica11(1): 33-45.
Sulfuric acid copper(2+) salt (1:1)	Danio	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	T	1500	NR	NR	ug/L	LAB	1994. Singh, B.K., and S.P. Singh. Toxic Effects of Some Inorganic Salts on Testes of Fresh Water Fish Danio equipinatus (HAM). Proc. Acad. Environ. Biol.3(2): 241-244.
Sulfuric acid copper(2+) salt (1:1)	Eastern Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Eastern Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	390	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Eastern Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Eastern Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Eastern Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Eastern Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Eastern Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Eastern Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Eastern Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Eastern Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Fantail Darter	Fish	Fresh	Growth	NR		T	107	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fantail Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1988. Lydy, M.J., and T.E. Wissing. Effect of Sublethal Concentrations of Copper on the Critical Thermal Maxima (CTMax) of the Fantail (Etheostoma flabellare) and Johnny (E. nigrum). Aquat. Toxicol.12(4): 311-322.
Sulfuric acid copper(2+) salt (1:1)	Fantail Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	341	NA	NR	ug/L	LAB	1988. Lydy, M.J., and T.E. Wissing. Effect of Sublethal Concentrations of Copper on the Critical Thermal Maxima (CTMax) of the Fantail (Etheostoma flabellare) and Johnny (E. nigrum). Aquat. Toxicol.12(4): 311-322.
Sulfuric acid copper(2+) salt (1:1)	Fantail Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	373	NA	NR	ug/L	LAB	1988. Lydy, M.J., and T.E. Wissing. Effect of Sublethal Concentrations of Copper on the Critical Thermal Maxima (CTMax) of the Fantail (Etheostoma flabellare) and Johnny (E. nigrum). Aquat. Toxicol.12(4): 311-322.
Sulfuric acid copper(2+) salt (1:1)	Fantail Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	392	NA	NR	ug/L	LAB	1988. Lydy, M.J., and T.E. Wissing. Effect of Sublethal Concentrations of Copper on the Critical Thermal Maxima (CTMax) of the Fantail (Etheostoma flabellare) and Johnny (E. nigrum). Aquat. Toxicol.12(4): 311-322.
Sulfuric acid copper(2+) salt (1:1)	Fantail Darter	Fish	Fresh	Mortality	NR	Not Reported	T	107	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.11	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.14	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.15	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.19	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.22	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.22	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.25	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.26	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.28	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.31	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.41	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.46	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.6	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.6	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.78	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	0.82	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	1.4	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	1.5	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	2	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	2.4	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC10	Not Reported	T	10	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC10	Not Reported	T	10	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC10	Not Reported	T	16	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC10	Not Reported	T	16	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC10	Not Reported	T	24	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC10	Not Reported	T	32	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	64.6		NC	ug/L	LAB	2003. Geis, S.W., K. Fleming, A. Mager, and L. Reynolds. Modifications to the Fathead Minnow (Pimephales promelas) Chronic Test Method to Remove Mortality due to Pathogenic Organisms. Environ. Toxicol. Chem.22(10): 2400-2404.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	71.9		NC	ug/L	LAB	2003. Geis, S.W., K. Fleming, A. Mager, and L. Reynolds. Modifications to the Fathead Minnow (Pimephales promelas) Chronic Test Method to Remove Mortality due to Pathogenic Organisms. Environ. Toxicol. Chem.22(10): 2400-2404.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	103000	NR	NR	ug/L	LAB	2005. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, T. Augspurger, T.J. Canfield, D.R. Mount, and F.L.. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part III. Effluent Toxicity Tests. Arch. Environ. Contam. Toxicol.48(2): 174-183.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	6300	NR	NR	ug/L	LAB	2005. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, T. Augspurger, T.J. Canfield, D.R. Mount, and F.L.. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part III. Effluent Toxicity Tests. Arch. Environ. Contam. Toxicol.48(2): 174-183.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	11	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	11	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	15	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	15	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	23	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	11	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	12	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Not Reported	T	20	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	16.1	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	4.4	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	11.5	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	22.7	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	4.4	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	12	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	23	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	12.5	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	12.5	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	12.5	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	25	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	38	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	25	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	25	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	38	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	16.1	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	5.3	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	10.6	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	11.5	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	22.7	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	160	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	180	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEL	Not Reported	T	3.57		NC	ug/L	LAB	2005. Diamond, J., M. Bowersox, H. Latimer, C. Barbour, J. Bearr, and J. Butcher. Effects of Pulsed Contaminant Exposures on Early Life Stages of the Fathead Minnow. Arch. Environ. Contam. Toxicol.49(4): 511-519.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEL	Whole Organism	T	1.78		NC	ug/L	LAB	2005. Diamond, J., M. Bowersox, H. Latimer, C. Barbour, J. Bearr, and J. Butcher. Effects of Pulsed Contaminant Exposures on Early Life Stages of the Fathead Minnow. Arch. Environ. Contam. Toxicol.49(4): 511-519.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEL	Whole Organism	T	1.78		NC	ug/L	LAB	2005. Diamond, J., M. Bowersox, H. Latimer, C. Barbour, J. Bearr, and J. Butcher. Effects of Pulsed Contaminant Exposures on Early Life Stages of the Fathead Minnow. Arch. Environ. Contam. Toxicol.49(4): 511-519.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Copper	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	16	NA	NR	ug/L	LAB	1985. Norberg, T.J., and D.I. Mount. A New Fathead Minnow (Pimephales promelas) Subchronic Toxicity Test. Environ. Toxicol. Chem.4(5): 711-718.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	11	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	16	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	2.9	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	17.7	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	17.7	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	27	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	27	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	35	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	35	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	35	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	35	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	35	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	8.8	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	8.8	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	8.8	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	150	NR	NR	ug/L	LAB	2008. Pistole, D.H., J.D. Peles, and K. Taylor. Influence of Metal Concentrations, Percent Salinity, and Length of Exposure on the Metabolic Rate of Fathead Minnows (Pimephales promelas). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.148(1): 48-52.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	150	NR	NR	ug/L	LAB	2008. Pistole, D.H., J.D. Peles, and K. Taylor. Influence of Metal Concentrations, Percent Salinity, and Length of Exposure on the Metabolic Rate of Fathead Minnows (Pimephales promelas). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.148(1): 48-52.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	11.2	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	11.1	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	9.3	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	11	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	9.3	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	6.3	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	6.3	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	12	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	19	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	19	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	25	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	25	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	25	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	25	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	25	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	6.3	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	12.5	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	42.8	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	8.6	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	100000	NA	NR	ug/L	LAB	1994. Foster, S.C., S.L. Burks, D.J. Fort, E.L. Stover, and M.D. Matlock. Development and Evaluation of a Nondestructive Measure of Fish Growth for Sublethal Toxicity Assessment. Bull. Environ. Contam. Toxicol.53(1): 85-90.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	150000	NA	NR	ug/L	LAB	1994. Foster, S.C., S.L. Burks, D.J. Fort, E.L. Stover, and M.D. Matlock. Development and Evaluation of a Nondestructive Measure of Fish Growth for Sublethal Toxicity Assessment. Bull. Environ. Contam. Toxicol.53(1): 85-90.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	60000	NA	NR	ug/L	LAB	1994. Foster, S.C., S.L. Burks, D.J. Fort, E.L. Stover, and M.D. Matlock. Development and Evaluation of a Nondestructive Measure of Fish Growth for Sublethal Toxicity Assessment. Bull. Environ. Contam. Toxicol.53(1): 85-90.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	50000	NA	NR	ug/L	LAB	1994. Foster, S.C., S.L. Burks, D.J. Fort, E.L. Stover, and M.D. Matlock. Development and Evaluation of a Nondestructive Measure of Fish Growth for Sublethal Toxicity Assessment. Bull. Environ. Contam. Toxicol.53(1): 85-90.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	11.2	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	3.6	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	11.1	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	6.5	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	T	9.3	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEL	Whole Organism	T	5.36		NC	ug/L	LAB	2005. Diamond, J., M. Bowersox, H. Latimer, C. Barbour, J. Bearr, and J. Butcher. Effects of Pulsed Contaminant Exposures on Early Life Stages of the Fathead Minnow. Arch. Environ. Contam. Toxicol.49(4): 511-519.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEL	Whole Organism	T	2.68		NC	ug/L	LAB	2005. Diamond, J., M. Bowersox, H. Latimer, C. Barbour, J. Bearr, and J. Butcher. Effects of Pulsed Contaminant Exposures on Early Life Stages of the Fathead Minnow. Arch. Environ. Contam. Toxicol.49(4): 511-519.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	204	NA	NR	ug/L	LAB	1988. Scudder, B.C., J.L. Carter, and H.V. Leland. Effects of Copper on Development of the Fathead Minnow, Pimephales promelas Rafinesque. Aquat. Toxicol.12(2): 107-124.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	338	NA	NR	ug/L	LAB	1988. Scudder, B.C., J.L. Carter, and H.V. Leland. Effects of Copper on Development of the Fathead Minnow, Pimephales promelas Rafinesque. Aquat. Toxicol.12(2): 107-124.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	2.5	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	3.6	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Schlueter, M.A., S.I. Guttman, J.T. Oris, and A.J. Bailer. Differential Survival of Fathead Minnows, Pimephales promelas, as Affected by Copper Exposure, Prior Population Stress, and Allozyme Genotypes. Environ. Toxicol. Chem.16(5): 939-947.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NA	NR	uM	LAB	1995. Sanders, B.M., J. Nguyen, L.S. Martin, S.R. Howe, and S. Coventry. Induction and Subcellular Localization of Two Major Stress Proteins in Response to Copper in the Fathead Minnow Pimephales promelas. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.112(3): 335-343.

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Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NA	NR	uM	LAB	1995. Sanders, B.M., J. Nguyen, L.S. Martin, S.R. Howe, and S. Coventry. Induction and Subcellular Localization of Two Major Stress Proteins in Response to Copper in the Fathead Minnow Pimephales promelas. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.112(3): 335-343.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	3.6	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	5.3	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	9	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	13.1	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR		T	316	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR		T	105	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR		T	10.6	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR		T	10.6	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR		T	18.4	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Copper	Fathead Minnow	Fish	Fresh	Mortality	EC50	Not Reported	T	201		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	EC50	Not Reported	T	656		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC10	Not Reported	T	19	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC10	Not Reported	T	19	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC10	Not Reported	T	24	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC10	Not Reported	T	19	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC10	Not Reported	T	19	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC10	Not Reported	T	24	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC25	Not Reported	T	28	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC25	Not Reported	T	29	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC25	Not Reported	T	36	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC25	Not Reported	T	28	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC25	Not Reported	T	29	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	IC25	Not Reported	T	36	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	480.8		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1007.7		NC	ug/L	LAB	2004. Kolok, A.S., E.B. Peake, L.L. Tierney, S.A. Roark, R.B. Noble, K. See, and S.I. Guttman. Copper Tolerance in Fathead Minnows: I. The Role of Genetic and Nongenetic Factors. Environ. Toxicol. Chem.23(1): 200-207.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	188.3		NC	ug/L	LAB	2004. Kolok, A.S., E.B. Peake, L.L. Tierney, S.A. Roark, R.B. Noble, K. See, and S.I. Guttman. Copper Tolerance in Fathead Minnows: I. The Role of Genetic and Nongenetic Factors. Environ. Toxicol. Chem.23(1): 200-207.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	360.8		NC	ug/L	LAB	2004. Kolok, A.S., E.B. Peake, L.L. Tierney, S.A. Roark, R.B. Noble, K. See, and S.I. Guttman. Copper Tolerance in Fathead Minnows: I. The Role of Genetic and Nongenetic Factors. Environ. Toxicol. Chem.23(1): 200-207.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	787.6		NC	ug/L	LAB	2004. Kolok, A.S., E.B. Peake, L.L. Tierney, S.A. Roark, R.B. Noble, K. See, and S.I. Guttman. Copper Tolerance in Fathead Minnows: I. The Role of Genetic and Nongenetic Factors. Environ. Toxicol. Chem.23(1): 200-207.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.57	NR	NR	uM	LAB	2006. Zahner, H.M., E.J. VanGenderen, J.R. Tomasso, and S.J. Klaine. Whole-Body Sodium Concentration in Larval Fathead Minnows (Pimephales promelas) During and Following Copper Exposure. Environ. Toxicol. Chem.25(6): 1635-1639.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	284	NR	NR	ug/L	LAB	1994. Dobbs, M.G., J.L. Farris, R.J. Reash, D.S. Cherry, and J.,Jr. Cairns. Evaluation of the Resident-Species Procedure for Developing Site-Specific Water Quality Criteria for Copper in Blaine Creek, Kentucky. Environ. Toxicol. Chem.13(6): 963-971.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.3	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	102	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	115	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	27.8	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	31.2	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.4	NA	NR	ug/L	LAB	1993. Playle, R.C., D.G. Dixon, and K. Burnison. Copper and Cadmium Binding to Fish Gills: Estimates of Metal-Gill Stability Constants and Modelling of Metal Accumulation. Can. J. Fish. Aquat. Sci.50: 2678-2687.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	D	630	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	D	870	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	D	770	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	D	750	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	D	730	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	D	840	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	D	860	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	D	600	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2200	D	690	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	D	930	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3300	D	750	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3500	D	820	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	D	830	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9700	D	980	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5600	NR	NR	ug/L	LAB	1976. Brungs, W.A., J.R. Geckler, and M. Gast. Acute and Chronic Toxicity of Copper to the Fathead Minnow in a Surface Water of Variable Quality. Water Res.10(1): 37-43.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	M	LAB	2007. Meyer, J.S., C.J. Boese, and J.M. Morris. Use of the Biotic Ligand Model to Predict Pulse-Exposure Toxicity of Copper to Fathead Minnows (Pimephales promelas). Aquat. Toxicol.84(2): 268-278.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	M	LAB	2007. Meyer, J.S., C.J. Boese, and J.M. Morris. Use of the Biotic Ligand Model to Predict Pulse-Exposure Toxicity of Copper to Fathead Minnows (Pimephales promelas). Aquat. Toxicol.84(2): 268-278.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	M	LAB	2007. Meyer, J.S., C.J. Boese, and J.M. Morris. Use of the Biotic Ligand Model to Predict Pulse-Exposure Toxicity of Copper to Fathead Minnows (Pimephales promelas). Aquat. Toxicol.84(2): 268-278.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	M	LAB	2007. Meyer, J.S., C.J. Boese, and J.M. Morris. Use of the Biotic Ligand Model to Predict Pulse-Exposure Toxicity of Copper to Fathead Minnows (Pimephales promelas). Aquat. Toxicol.84(2): 268-278.
Copper	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1985. Norberg, T.J., and D.I. Mount. A New Fathead Minnow (Pimephales promelas) Subchronic Toxicity Test. Environ. Toxicol. Chem.4(5): 711-718.
Copper chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	323	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	511	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	55	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	85	NA	NR	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Development and Validation of Site-Specific Water Quality Criteria for Copper. Environ. Toxicol. Chem.5: 997-1012.
Copper chloride (CuCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	400		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	503		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	636		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	647		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	747		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	837		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	434		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	442		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	502		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Nitric acid, Copper(2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	96	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Nitric acid, Copper(2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Copper(2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	44	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19.2		NC	ug/L	LAB	2000. Mastin, B.J., and J.H.,Jr. Rodgers. Toxicity and Bioavailability of Copper Herbicides (Clearigate, Cutrine-Plus, and Copper Sulfate) to Freshwater Animals. Arch. Environ. Contam. Toxicol.39(4): 445-451.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	675.2		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3580	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4430	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1830	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3220	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1280	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2750	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	910	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2100	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	630	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	680	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	730	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.36	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.94	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.4	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.66	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.68	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.72	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.98	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.2	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.6	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.6	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.7	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.8	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	D	950	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	520	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	580	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	D	690	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	914	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	720	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	1680	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1700	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	390	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	460	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	530	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	550	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	580	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	720	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	730	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	17000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3700	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6700	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	780	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9100	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	940	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	42.2	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.2	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
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Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.3	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	35.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.8	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	D	950	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	470	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5200	D	650	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	580	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8500	D	720	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	621	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NR	NR	ug/L	LAB	2009. Lewis, S.S., and S.J. Keller. Identification of Copper-Responsive Genes in an Early Life Stage of the Fathead Minnow Pimephales promelas. Ecotoxicology18(3): 281-292.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
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Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
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Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
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Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
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Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
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Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Van Genderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Evaluation of Acute Copper Toxicity to Larval Fathead Minnows (Pimephales promelas) in Soft Surface Waters. Environ. Toxicol. Chem.24(2): 408-414.
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Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	44.2	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	145.8	D	139.8	ug/L	LAB	1997. Diamond, J.M., C. Gerardi, E. Leppo, and T. Miorelli. Using a Water-Effect Ratio Approach to Establish Effects of an Effluent-Influenced Stream on Copper Toxicity to the Fathead Minnow. Environ. Toxicol. Chem.16(7): 1480-1487.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	17.7	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1975	D	1551	ug/L	LAB	1997. Diamond, J.M., C. Gerardi, E. Leppo, and T. Miorelli. Using a Water-Effect Ratio Approach to Establish Effects of an Effluent-Influenced Stream on Copper Toxicity to the Fathead Minnow. Environ. Toxicol. Chem.16(7): 1480-1487.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	20.2	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	225	D	197	ug/L	LAB	1997. Diamond, J.M., C. Gerardi, E. Leppo, and T. Miorelli. Using a Water-Effect Ratio Approach to Establish Effects of an Effluent-Influenced Stream on Copper Toxicity to the Fathead Minnow. Environ. Toxicol. Chem.16(7): 1480-1487.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	297.1	D	257.1	ug/L	LAB	1997. Diamond, J.M., C. Gerardi, E. Leppo, and T. Miorelli. Using a Water-Effect Ratio Approach to Establish Effects of an Effluent-Influenced Stream on Copper Toxicity to the Fathead Minnow. Environ. Toxicol. Chem.16(7): 1480-1487.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	68.9	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	692	D	708	ug/L	LAB	1997. Diamond, J.M., C. Gerardi, E. Leppo, and T. Miorelli. Using a Water-Effect Ratio Approach to Establish Effects of an Effluent-Influenced Stream on Copper Toxicity to the Fathead Minnow. Environ. Toxicol. Chem.16(7): 1480-1487.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	10.2	NR	NR	ug/L	LAB	2008. Van Genderen, E.J., J.R. Tomasso, and S.J. Klaine. Influence of Copper Exposure on Whole-Body Sodium Levels in Larval Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.27(6): 1442-1449.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	12.8	NR	NR	ug/L	LAB	2008. Van Genderen, E.J., J.R. Tomasso, and S.J. Klaine. Influence of Copper Exposure on Whole-Body Sodium Levels in Larval Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.27(6): 1442-1449.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	13.2	NR	NR	ug/L	LAB	2008. Van Genderen, E.J., J.R. Tomasso, and S.J. Klaine. Influence of Copper Exposure on Whole-Body Sodium Levels in Larval Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.27(6): 1442-1449.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	15.3	NR	NR	ug/L	LAB	2008. Van Genderen, E.J., J.R. Tomasso, and S.J. Klaine. Influence of Copper Exposure on Whole-Body Sodium Levels in Larval Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.27(6): 1442-1449.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	21.4	NR	NR	ug/L	LAB	2008. Van Genderen, E.J., J.R. Tomasso, and S.J. Klaine. Influence of Copper Exposure on Whole-Body Sodium Levels in Larval Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.27(6): 1442-1449.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	24.4	NR	NR	ug/L	LAB	2008. Van Genderen, E.J., J.R. Tomasso, and S.J. Klaine. Influence of Copper Exposure on Whole-Body Sodium Levels in Larval Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.27(6): 1442-1449.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	30.2	NR	NR	ug/L	LAB	2008. Van Genderen, E.J., J.R. Tomasso, and S.J. Klaine. Influence of Copper Exposure on Whole-Body Sodium Levels in Larval Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.27(6): 1442-1449.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	5.9	NR	NR	ug/L	LAB	2008. Van Genderen, E.J., J.R. Tomasso, and S.J. Klaine. Influence of Copper Exposure on Whole-Body Sodium Levels in Larval Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.27(6): 1442-1449.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	7.2	NR	NR	ug/L	LAB	2008. Van Genderen, E.J., J.R. Tomasso, and S.J. Klaine. Influence of Copper Exposure on Whole-Body Sodium Levels in Larval Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.27(6): 1442-1449.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	7.5	NR	NR	ug/L	LAB	2008. Van Genderen, E.J., J.R. Tomasso, and S.J. Klaine. Influence of Copper Exposure on Whole-Body Sodium Levels in Larval Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.27(6): 1442-1449.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	7.8	NR	NR	ug/L	LAB	2008. Van Genderen, E.J., J.R. Tomasso, and S.J. Klaine. Influence of Copper Exposure on Whole-Body Sodium Levels in Larval Fathead Minnows (Pimephales promelas). Environ. Toxicol. Chem.27(6): 1442-1449.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1160	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	480	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	520	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	580	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	17000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3300	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6700	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	780	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9100	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	940	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..

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Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	487	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	390	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	440	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	560	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	760	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	910	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.075	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.22	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.47	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.94	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1001	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1129	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	114	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	121	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1586	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2050	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2336	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	436	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	516	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	550	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	88.5	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.11	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.12	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.32	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.33	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.36	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.37	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.37	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.38	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.66	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.68	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.72	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.84	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.85	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.88	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.99	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.01	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.02	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.04	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.07	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.26	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.28	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.28	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.34	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.36	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.39	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.4	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.4	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.46	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.53	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.64	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.68	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.75	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.9	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.15	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.15	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.2	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.2	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.3	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.5	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.75	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.7	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.8	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.8	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.3	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.7	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Erickson, R.J., C.F. Kleiner, J.T. Fiandt, and T.L. Highland. Effect of Acclimation Period on the Relationship of Acute Copper Toxicity to Water Hardness for Fathead Minnows. Environ. Toxicol. Chem.16(4): 813-815.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	D	950	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	105	D	87	ug/L	LAB	1985. Nelson, H., D. Benoit, R. Erickson, V. Mattson, and J. Lindberg. The Effects of Variable Hardness, pH, Alkalinity, Suspended Clay, and Humics on the Chemical Speciation and Aquatic Toxicity of Copper. EPA/600/3-86/023, U.S.EPA, Duluth, MN: 120 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	D	540	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15000	D	1000	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	32	D	28	ug/L	LAB	1985. Nelson, H., D. Benoit, R. Erickson, V. Mattson, and J. Lindberg. The Effects of Variable Hardness, pH, Alkalinity, Suspended Clay, and Humics on the Chemical Speciation and Aquatic Toxicity of Copper. EPA/600/3-86/023, U.S.EPA, Duluth, MN: 120 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	420	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	420	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4500	D	620	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1977. Pickering, Q.H., W. Brungs, and M. Gast. Effect of Exposure Time and Copper Concentration on Reproduction of the Fathead Minnow (Pimephales promelas). Water Res.11(12): 1079-1083.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	490	NA	NR	ug/L	LAB	1977. Pickering, Q.H., W. Brungs, and M. Gast. Effect of Exposure Time and Copper Concentration on Reproduction of the Fathead Minnow (Pimephales promelas). Water Res.11(12): 1079-1083.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	60	D	50	ug/L	LAB	1985. Nelson, H., D. Benoit, R. Erickson, V. Mattson, and J. Lindberg. The Effects of Variable Hardness, pH, Alkalinity, Suspended Clay, and Humics on the Chemical Speciation and Aquatic Toxicity of Copper. EPA/600/3-86/023, U.S.EPA, Duluth, MN: 120 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7100	D	610	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	83	D	74	ug/L	LAB	1985. Nelson, H., D. Benoit, R. Erickson, V. Mattson, and J. Lindberg. The Effects of Variable Hardness, pH, Alkalinity, Suspended Clay, and Humics on the Chemical Speciation and Aquatic Toxicity of Copper. EPA/600/3-86/023, U.S.EPA, Duluth, MN: 120 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	95	D	79	ug/L	LAB	1985. Nelson, H., D. Benoit, R. Erickson, V. Mattson, and J. Lindberg. The Effects of Variable Hardness, pH, Alkalinity, Suspended Clay, and Humics on the Chemical Speciation and Aquatic Toxicity of Copper. EPA/600/3-86/023, U.S.EPA, Duluth, MN: 120 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	490	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	297	NA	NR	ug/L	LAB	1995. Richards, V.L., and T.L. Beitinger. Reciprocal Influences of Temperature and Copper on Survival of Fathead Minnows, Pimephales promelas. Bull. Environ. Contam. Toxicol.55(2): 230-236.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	311	NA	NR	ug/L	LAB	1995. Richards, V.L., and T.L. Beitinger. Reciprocal Influences of Temperature and Copper on Survival of Fathead Minnows, Pimephales promelas. Bull. Environ. Contam. Toxicol.55(2): 230-236.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	450	NA	NR	ug/L	LAB	1995. Richards, V.L., and T.L. Beitinger. Reciprocal Influences of Temperature and Copper on Survival of Fathead Minnows, Pimephales promelas. Bull. Environ. Contam. Toxicol.55(2): 230-236.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	513	NA	NR	ug/L	LAB	1995. Richards, V.L., and T.L. Beitinger. Reciprocal Influences of Temperature and Copper on Survival of Fathead Minnows, Pimephales promelas. Bull. Environ. Contam. Toxicol.55(2): 230-236.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	393	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	740	NA	NR	ug/L	LAB	1990. Bowen, G.M.R.. Joint Action of Sublethal Copper and Zinc on Locomotory Behaviour of Fathead Minnows. M.S.Thesis, Univ.of Guelph, Canada: 100 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	106.1	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	129	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	137	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	1405	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	1514	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	1526	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	1564	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	1681	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	1949	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	1959	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	2013	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	2034	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	259.5	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	283.6	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	363.6	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	383.7	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	395.5	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	402.4	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	422.1	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	429	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	468.1	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	494.8	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	499.5	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	596.3	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	597.7	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	613.3	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	671.2	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	726.5	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	774.3	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	96.6	NR	NR	ug/L	LAB	2004. Ryan, A.C., E.J. Van Genderen, J.R. Tomasso, and S.J. Klaine. Influence of Natural Organic Matter Source on Copper Toxicity to Larval Fathead Minnows (Pimephales promelas): Implications for the Biotic Ligand Model. Environ. Toxicol. Chem.23(6): 1567-1574.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1995. Schlueter, M.A., S.I. Guttman, J.T. Oris, and A.J. Bailer. Survival of Copper-Exposed Juvenile Fathead Minnows (Pimephales promelas) Differs Among Allozyme Genotypes. Environ. Toxicol. Chem.14(10): 1727-1734.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.22	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.32	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.35	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.38	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.42	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.42	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.44	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.58	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.72	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.05	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.07	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.12	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.24	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.32	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.34	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.45	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.46	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.56	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.65	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.7	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.73	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.75	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..

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Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.94	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11.1	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11.7	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12.3	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14.5	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14.7	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15.8	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16.9	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19.6	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.3	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.3	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.4	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.4	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.4	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.6	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.6	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.6	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.6	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.7	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.8	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.9	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	23.4	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	29.6	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.1	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.3	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.1	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.3	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.8	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.8	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.9	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	47.7	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	59.8	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.2	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.5	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.7	NR	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, and V.R. Mattson. A Prototype Toxicity Factors Model for Site-Specific Copper Water Quality Criteria. U.S.EPA, Duluth, MN: 36 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.2	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.27	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.34	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.67	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.98	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.08	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.32	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.46	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.48	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.9	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.94	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.6	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.7	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.7	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12.2	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12.5	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12.8	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	169.5	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19.8	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.1	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.15	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.25	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.35	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.35	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.65	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.85	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.95	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	20.6	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21.2	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	26.1	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	26.8	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.05	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.1	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.15	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.25	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.55	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.7	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	31.9	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.6	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.8	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.3	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	54.1	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.3	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.6	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.5	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.4	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.5	NA	NR	ug/L	LAB	1996. Welsh, P.G., J.L. Parrott, D.G. Dixon, P.V. Hodson, D.J. Spry, and G. Mierle. Estimating Acute Copper Toxicity to Larval Fathead Minnow (Pimephales promelas) in Soft Water from Measurements of Dissolved Organic Carbon, Calcium, and pH. Can. J. Fish. Aquat. Sci.53: 1263-1271.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	D	580	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	D	640	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	105.4	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10550	D	830	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11.1	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1190	D	680	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	D	780	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1450	D	690	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14500	D	920	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15.1	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15.7	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1580	D	820	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	D	750	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	180	D	171	ug/L	LAB	1985. Nelson, H., D. Benoit, R. Erickson, V. Mattson, and J. Lindberg. The Effects of Variable Hardness, pH, Alkalinity, Suspended Clay, and Humics on the Chemical Speciation and Aquatic Toxicity of Copper. EPA/600/3-86/023, U.S.EPA, Duluth, MN: 120 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	182	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.8	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	D	660	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21.1	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21800	D	960	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	22200	D	1090	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	22200	D	1400	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	23600	D	820	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	D	940	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2830	D	920	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	31.6	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3150	D	490	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3300	D	750	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	36	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	390	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.8	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.8	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.9	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4160	D	650	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4500	D	950	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4670	D	750	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	47.7	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	D	820	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5330	D	760	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	55	D	52	ug/L	LAB	1985. Nelson, H., D. Benoit, R. Erickson, V. Mattson, and J. Lindberg. The Effects of Variable Hardness, pH, Alkalinity, Suspended Clay, and Humics on the Chemical Speciation and Aquatic Toxicity of Copper. EPA/600/3-86/023, U.S.EPA, Duluth, MN: 120 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	59.8	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	70.3	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.2	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8300	D	1060	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	85.6	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8700	D	970	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.9	NA	NR	ug/L	LAB	1993. Welsh, P.G., J.F. Skidmore, D.J. Spry, D.G. Dixon, P.V. Hodson, N.J. Hutchinson, and B.E. Hickie. Effect of pH and Dissolved Organic Carbon on the Toxicity of Copper to Larval Fathead Minnow (Pimephales promelas) in Natural Lake Waters of Low Alkalinity. Can. J. Fish. Aquat. Sci.50(7): 1356-1362.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9000	D	810	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	920	D	600	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	838	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NR	NR	ug/L	LAB	2008. Johnson, B.M., M.M. Chao, O.R. Tedrow, A.D. McQueen, and J.H.,Jr. Rodgers. Responses of Lepomis macrochirus, Pimephales promelas, Hyalella azteca, Ceriodaphnia dubia, and Daphnia magna to Exposures of Algimycin PWF and Copper Sulfate Pentahydrate. J. Aquat. Plant Manage.46: 176-183.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	360	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	390	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	410	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	460	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	470	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	470	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	630	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	760	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	810	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	252	NA	NR	ug/L	LAB	1995. Bennett, W.A., A. Sosa, and T.L. Beitinger. Oxygen Tolerance of Fathead Minnows Previously Exposed to Copper. Bull. Environ. Contam. Toxicol.55(4): 517-524.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4900	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	840*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	440	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	480	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.1	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.24	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.26	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.27	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.49	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.59	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.61	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.63	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.77	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.79	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.8	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.9	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.91	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	0.92	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.04	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.14	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.21	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.5	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.9	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.4	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.6	NA	NR	uM	LAB	1996. Erickson, R.J., D.A. Benoit, V.R. Mattson, H.P.,Jr. Nelson, and E.N. Leonard. The Effects of Water Chemistry on the Toxicity of Copper to Fathead Minnows. Environ. Toxicol. Chem.15(2): 181-193.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	310	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.1	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	44.7	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.2	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10550	D	830	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	D	750	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1200	D	630	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	D	800	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1410	D	560	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14500	D	920	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	D	590	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1700	D	580	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21800	D	960	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2210	D	430	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	22200	D	1090	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	22200	D	1400	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	22200	D	790	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2400	D	670	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	D	940	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3190	D	650	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3630	D	650	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	400	D	360	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	D	740	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	560	D	440	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	800	D	800	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	820	D	560	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	890	D	460	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	900	D	900	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9000	D	760	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9500	D	640	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	55	D	51	ug/L	LAB	1985. Nelson, H., D. Benoit, R. Erickson, V. Mattson, and J. Lindberg. The Effects of Variable Hardness, pH, Alkalinity, Suspended Clay, and Humics on the Chemical Speciation and Aquatic Toxicity of Copper. EPA/600/3-86/023, U.S.EPA, Duluth, MN: 120 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	NR	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	NR	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	NR	Mortality	LC50	Not Reported	T	310	NR	NR	ug/L	NR	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	1590	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	2710	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	34	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	36	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	40	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	41	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	49*	NA	NR	ug/L	LAB	1956. Maloney, T.E., and C.M. Palmer. Toxicity of Six Chemical Compounds to Thirty Cultures of Algae. Water Sewage Works: 509-513.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	1140	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	1860	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	23	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	23	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	29	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	35	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	49*	NA	NR	ug/L	LAB	1956. Maloney, T.E., and C.M. Palmer. Toxicity of Six Chemical Compounds to Thirty Cultures of Algae. Water Sewage Works: 509-513.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	75000	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	470	NA	NR	ug/L	LAB	1968. Mount, D.I.. Chronic Toxicity of Copper to Fathead Minnows (Pimephales promelas, Rafinesque). Water Res.2(3): 215-223.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	1140	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	1400	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	1760	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	22	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	23	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	23	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	25	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	430	NA	NR	ug/L	LAB	1968. Mount, D.I.. Chronic Toxicity of Copper to Fathead Minnows (Pimephales promelas, Rafinesque). Water Res.2(3): 215-223.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	47*	NA	NR	ug/L	LAB	1956. Maloney, T.E., and C.M. Palmer. Toxicity of Six Chemical Compounds to Thirty Cultures of Algae. Water Sewage Works: 509-513.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	50	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	84000	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC90	Not Reported	T	800	NR	NR	ug/L	LAB	1997. Schlueter, M.A., S.I. Guttman, J.T. Oris, and A.J. Bailer. Differential Survival of Fathead Minnows, Pimephales promelas, as Affected by Copper Exposure, Prior Population Stress, and Allozyme Genotypes. Environ. Toxicol. Chem.16(5): 939-947.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC90	Not Reported	T	800	NR	NR	ug/L	LAB	1997. Schlueter, M.A., S.I. Guttman, J.T. Oris, and A.J. Bailer. Differential Survival of Fathead Minnows, Pimephales promelas, as Affected by Copper Exposure, Prior Population Stress, and Allozyme Genotypes. Environ. Toxicol. Chem.16(5): 939-947.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC90	Not Reported	T	950	NR	NR	ug/L	LAB	1997. Schlueter, M.A., S.I. Guttman, J.T. Oris, and A.J. Bailer. Differential Survival of Fathead Minnows, Pimephales promelas, as Affected by Copper Exposure, Prior Population Stress, and Allozyme Genotypes. Environ. Toxicol. Chem.16(5): 939-947.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LETC	Not Reported	T	17.2	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LETC	Not Reported	T	6.2	NR	NR	ug/L	LAB	1996. Welsh, P.G.. Influence of Dissolved Organic Carbon on the Speciation, Bioavailability and Toxicity of Metals to Aquatic Biota in Soft Water Lakes. Ph.D.Thesis, University of Waterloo, Ontario, Canada: 181 p..
Copper	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	300		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	250		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	28	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	40	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	42	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	2008. Johnson, B.M., M.M. Chao, O.R. Tedrow, A.D. McQueen, and J.H.,Jr. Rodgers. Responses of Lepomis macrochirus, Pimephales promelas, Hyalella azteca, Ceriodaphnia dubia, and Daphnia magna to Exposures of Algimycin PWF and Copper Sulfate Pentahydrate. J. Aquat. Plant Manage.46: 176-183.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	42.1	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	39.8	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	28.3	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	12.5	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	200	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	200	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	200	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	200	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	300	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	400	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	150	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	5.36		NC	ug/L	LAB	2005. Diamond, J., M. Bowersox, H. Latimer, C. Barbour, J. Bearr, and J. Butcher. Effects of Pulsed Contaminant Exposures on Early Life Stages of the Fathead Minnow. Arch. Environ. Contam. Toxicol.49(4): 511-519.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	3.57		NC	ug/L	LAB	2005. Diamond, J., M. Bowersox, H. Latimer, C. Barbour, J. Bearr, and J. Butcher. Effects of Pulsed Contaminant Exposures on Early Life Stages of the Fathead Minnow. Arch. Environ. Contam. Toxicol.49(4): 511-519.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	1.78		NC	ug/L	LAB	2005. Diamond, J., M. Bowersox, H. Latimer, C. Barbour, J. Bearr, and J. Butcher. Effects of Pulsed Contaminant Exposures on Early Life Stages of the Fathead Minnow. Arch. Environ. Contam. Toxicol.49(4): 511-519.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	2.68		NC	ug/L	LAB	2005. Diamond, J., M. Bowersox, H. Latimer, C. Barbour, J. Bearr, and J. Butcher. Effects of Pulsed Contaminant Exposures on Early Life Stages of the Fathead Minnow. Arch. Environ. Contam. Toxicol.49(4): 511-519.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	22	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	28	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	31	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Copper	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	200		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Copper	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	28300	NR	NR	ug/L	LAB	1993. Dorn, P.B., J.P. Salanitro, S.H. Evans, and L. Kravetz. Assessing the Aquatic Hazard of Some Branched and Linear Nonionic Surfactants by Biodegradation and Toxicity. Environ. Toxicol. Chem.12(10): 1751-1762.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	125		NC	ug/L	LAB	2002. Murray-Gulde, C.L., J.E. Heatley, A.L. Schwartzman, and J.H.,Jr. Rodgers. Algicidal Effectiveness of Clearigate, Cutrine-Plus, and Copper Sulfate and Margins of Safety Associated with Their Use. Arch. Environ. Contam. Toxicol.43(1): 19-27.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	34	NR	NR	ug/L	LAB	2006. Gauthier, C., P. Couture, and G.G. Pyle. Metal Effects on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. Ecotoxicol. Environ. Saf.63(3): 353-364.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	34	NR	NR	ug/L	LAB	2006. Gauthier, C., P. Couture, and G.G. Pyle. Metal Effects on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. Ecotoxicol. Environ. Saf.63(3): 353-364.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	34	NR	NR	ug/L	LAB	2006. Gauthier, C., P. Couture, and G.G. Pyle. Metal Effects on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. Ecotoxicol. Environ. Saf.63(3): 353-364.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	34	NR	NR	ug/L	LAB	2006. Gauthier, C., P. Couture, and G.G. Pyle. Metal Effects on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. Ecotoxicol. Environ. Saf.63(3): 353-364.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	34	NR	NR	ug/L	LAB	2006. Gauthier, C., P. Couture, and G.G. Pyle. Metal Effects on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. Ecotoxicol. Environ. Saf.63(3): 353-364.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2004. Gauthier, C.. Effects of Sub-lethal Metal Exposure on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. M.S.Thesis, Laurentian Univ., Sudbury, Ontario: 73 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2004. Gauthier, C.. Effects of Sub-lethal Metal Exposure on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. M.S.Thesis, Laurentian Univ., Sudbury, Ontario: 73 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2004. Gauthier, C.. Effects of Sub-lethal Metal Exposure on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. M.S.Thesis, Laurentian Univ., Sudbury, Ontario: 73 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2004. Gauthier, C.. Effects of Sub-lethal Metal Exposure on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. M.S.Thesis, Laurentian Univ., Sudbury, Ontario: 73 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2004. Gauthier, C.. Effects of Sub-lethal Metal Exposure on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. M.S.Thesis, Laurentian Univ., Sudbury, Ontario: 73 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	42.8	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	8.6	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	15.1	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	20.2	NA	NR	ug/L	LAB	1996. Suedel, B.C., E. Deaver, and J.H.,Jr. Rodgers. Experimental Factors that may Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Arch. Environ. Contam. Toxicol.30(1): 40-46.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	17	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	19	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	23	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	34	NR	NR	ug/L	LAB	2006. Gauthier, C., P. Couture, and G.G. Pyle. Metal Effects on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. Ecotoxicol. Environ. Saf.63(3): 353-364.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	34	NR	NR	ug/L	LAB	2006. Gauthier, C., P. Couture, and G.G. Pyle. Metal Effects on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. Ecotoxicol. Environ. Saf.63(3): 353-364.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	34	NR	NR	ug/L	LAB	2006. Gauthier, C., P. Couture, and G.G. Pyle. Metal Effects on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. Ecotoxicol. Environ. Saf.63(3): 353-364.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	34	NR	NR	ug/L	LAB	2006. Gauthier, C., P. Couture, and G.G. Pyle. Metal Effects on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. Ecotoxicol. Environ. Saf.63(3): 353-364.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	34	NR	NR	ug/L	LAB	2006. Gauthier, C., P. Couture, and G.G. Pyle. Metal Effects on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. Ecotoxicol. Environ. Saf.63(3): 353-364.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2004. Gauthier, C.. Effects of Sub-lethal Metal Exposure on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. M.S.Thesis, Laurentian Univ., Sudbury, Ontario: 73 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2004. Gauthier, C.. Effects of Sub-lethal Metal Exposure on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. M.S.Thesis, Laurentian Univ., Sudbury, Ontario: 73 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2004. Gauthier, C.. Effects of Sub-lethal Metal Exposure on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. M.S.Thesis, Laurentian Univ., Sudbury, Ontario: 73 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2004. Gauthier, C.. Effects of Sub-lethal Metal Exposure on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. M.S.Thesis, Laurentian Univ., Sudbury, Ontario: 73 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2004. Gauthier, C.. Effects of Sub-lethal Metal Exposure on Fathead Minnows (Pimephales promelas) Under Field and Laboratory Conditions. M.S.Thesis, Laurentian Univ., Sudbury, Ontario: 73 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	19.2	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	16.7	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	22.7	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	25	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	25	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	150	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	200	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	200	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	6.3	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	75	NR	NR	ug/L	LAB	1995. Pickering, Q.H., and J.M. Lazorchak. Evaluation of the Robustness of the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test, U.S. EPA Method 1000.0. Environ. Toxicol. Chem.14(4): 653-659.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	1.78		NC	ug/L	LAB	2005. Diamond, J., M. Bowersox, H. Latimer, C. Barbour, J. Bearr, and J. Butcher. Effects of Pulsed Contaminant Exposures on Early Life Stages of the Fathead Minnow. Arch. Environ. Contam. Toxicol.49(4): 511-519.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEL	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Bearr, J.S., J. Diamond, H. Latimer, and M. Bowersox. Effects of Pulsed Copper Exposures on Early Life-Stage Pimephales promelas. Environ. Toxicol. Chem.25(5): 1376-1382.
Copper	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	224.5	NR	NR	ug/L	LAB	2005. Kolok, A.S., and D. L'Etoile-Lopes. Do Copper Tolerant Fathead Minnows Produce Copper Tolerant Adult Offspring?. Aquat. Toxicol.72(3): 231-238.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Scudder, B.C., J.L. Carter, and H.V. Leland. Effects of Copper on Development of the Fathead Minnow, Pimephales promelas Rafinesque. Aquat. Toxicol.12(2): 107-124.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	8	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2009. Lewis, S.S., and S.J. Keller. Identification of Copper-Responsive Genes in an Early Life Stage of the Fathead Minnow Pimephales promelas. Ecotoxicology18(3): 281-292.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	724	NA	NR	ug/L	LAB	1995. Schlueter, M.A., S.I. Guttman, J.T. Oris, and A.J. Bailer. Survival of Copper-Exposed Juvenile Fathead Minnows (Pimephales promelas) Differs Among Allozyme Genotypes. Environ. Toxicol. Chem.14(10): 1727-1734.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Schlueter, M.A., S.I. Guttman, J.T. Oris, and A.J. Bailer. Differential Survival of Fathead Minnows, Pimephales promelas, as Affected by Copper Exposure, Prior Population Stress, and Allozyme Genotypes. Environ. Toxicol. Chem.16(5): 939-947.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1997. Schlueter, M.A., S.I. Guttman, J.T. Oris, and A.J. Bailer. Differential Survival of Fathead Minnows, Pimephales promelas, as Affected by Copper Exposure, Prior Population Stress, and Allozyme Genotypes. Environ. Toxicol. Chem.16(5): 939-947.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	26.2	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	13.1	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	101	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	118	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	561	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	66	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	15	NA	NR	ug/L	LAB	1968. Mount, D.I.. Chronic Toxicity of Copper to Fathead Minnows (Pimephales promelas, Rafinesque). Water Res.2(3): 215-223.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	97	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	96	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	101	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	316	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	105	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	4.4	NA	NR	ug/L	LAB	1968. Mount, D.I.. Chronic Toxicity of Copper to Fathead Minnows (Pimephales promelas, Rafinesque). Water Res.2(3): 215-223.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	95	NA	NR	ug/L	LAB	1968. Mount, D.I.. Chronic Toxicity of Copper to Fathead Minnows (Pimephales promelas, Rafinesque). Water Res.2(3): 215-223.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Mount, D.I.. Chronic Toxicity of Copper to Fathead Minnows (Pimephales promelas, Rafinesque). Water Res.2(3): 215-223.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Mount, D.I.. Chronic Toxicity of Copper to Fathead Minnows (Pimephales promelas, Rafinesque). Water Res.2(3): 215-223.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Mount, D.I.. Chronic Toxicity of Copper to Fathead Minnows (Pimephales promelas, Rafinesque). Water Res.2(3): 215-223.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	10.6	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	10.6	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	18.4	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	4.4	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	4.4	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	7.7	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	7.7	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	97	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	96	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	561	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Copper	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	175		NC	ug/L	LAB	2004. Kolok, A.S., E.B. Peake, L.L. Tierney, S.A. Roark, R.B. Noble, K. See, and S.I. Guttman. Copper Tolerance in Fathead Minnows: I. The Role of Genetic and Nongenetic Factors. Environ. Toxicol. Chem.23(1): 200-207.
Copper	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	175		NC	ug/L	LAB	2004. Kolok, A.S., E.B. Peake, L.L. Tierney, S.A. Roark, R.B. Noble, K. See, and S.I. Guttman. Copper Tolerance in Fathead Minnows: I. The Role of Genetic and Nongenetic Factors. Environ. Toxicol. Chem.23(1): 200-207.
Copper	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	151.1	NR	NR	ug/L	LAB	2005. Kolok, A.S., and D. L'Etoile-Lopes. Do Copper Tolerant Fathead Minnows Produce Copper Tolerant Adult Offspring?. Aquat. Toxicol.72(3): 231-238.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	151.1	NR	NR	ug/L	LAB	2005. Kolok, A.S., and D. L'Etoile-Lopes. Do Copper Tolerant Fathead Minnows Produce Copper Tolerant Adult Offspring?. Aquat. Toxicol.72(3): 231-238.
Copper	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	151.1	NR	NR	ug/L	LAB	2005. Kolok, A.S., and D. L'Etoile-Lopes. Do Copper Tolerant Fathead Minnows Produce Copper Tolerant Adult Offspring?. Aquat. Toxicol.72(3): 231-238.
Copper	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	224.5	NR	NR	ug/L	LAB	2005. Kolok, A.S., and D. L'Etoile-Lopes. Do Copper Tolerant Fathead Minnows Produce Copper Tolerant Adult Offspring?. Aquat. Toxicol.72(3): 231-238.
Copper	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	224.5	NR	NR	ug/L	LAB	2005. Kolok, A.S., and D. L'Etoile-Lopes. Do Copper Tolerant Fathead Minnows Produce Copper Tolerant Adult Offspring?. Aquat. Toxicol.72(3): 231-238.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	127	NR	NR	ug/L	LAB	2008. Tate-Boldt, E.K., and A.S. Kolok. Copper Acclimation in Juvenile Fathead Minnows: Is a Cycle of Branchial Damage and Repair Necessary?. Aquat. Toxicol.87(1): 13-18.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	150	NR	NR	ug/L	LAB	2008. Pistole, D.H., J.D. Peles, and K. Taylor. Influence of Metal Concentrations, Percent Salinity, and Length of Exposure on the Metabolic Rate of Fathead Minnows (Pimephales promelas). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.148(1): 48-52.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	26	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	38	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	112.5	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	59.1	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	15	NA	NR	ug/L	LAB	1968. Mount, D.I.. Chronic Toxicity of Copper to Fathead Minnows (Pimephales promelas, Rafinesque). Water Res.2(3): 215-223.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	33	NA	NR	ug/L	LAB	1968. Mount, D.I.. Chronic Toxicity of Copper to Fathead Minnows (Pimephales promelas, Rafinesque). Water Res.2(3): 215-223.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	10.6	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	18.4	NA	NR	ug/L	LAB	1969. Mount, D.I., and C.E. Stephan. Chronic Toxicity of Copper to the Fathead Minnow (Pimephales promelas) in Soft Water. J. Fish. Res. Board Can.26(9): 2449-2457.
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	97	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	23	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	36	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1590	NA	NR	ug/L	LAB	1977. Fogels, A., and J.B. Sprague. Comparative Short-Term Tolerance of Zebrafish, Flagfish, and Rainbow Trout to Five Poisons Including Potential Reference Toxicants. Water Res.11(9): 811-817.
Sulfuric acid copper(2+) salt (1:1)	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1270	NA	NR	ug/L	LAB	1977. Fogels, A., and J.B. Sprague. Comparative Short-Term Tolerance of Zebrafish, Flagfish, and Rainbow Trout to Five Poisons Including Potential Reference Toxicants. Water Res.11(9): 811-817.
Sulfuric acid copper(2+) salt (1:1)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	242	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Sulfuric acid copper(2+) salt (1:1)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	182	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Sulfuric acid copper(2+) salt (1:1)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	182	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Sulfuric acid copper(2+) salt (1:1)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	175	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Sulfuric acid copper(2+) salt (1:1)	Fly Specked Hardyhead	Fish	Fresh	Mortality	LC50	Not Reported	T	17	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fly Specked Hardyhead	Fish	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid copper(2+) salt (1:1)	Fly Specked Hardyhead	Fish	Fresh	Mortality	LC50	Not Reported	T	21	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid copper(2+) salt (1:1)	Flying Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	2130	NR	NR	ug/L	LAB	2006. Vutukuru, S.S., S. Chintada, K. Radha Madhavi, J. Venkateswara Rao, and Y. Anjaneyulu. Acute Effects of Copper on Superoxide Dismutase, Catalase and Lipid Peroxidation in the Freshwater Teleost Fish, Esomus danricus. Fish Physiol. Biochem.32(3): 221-229.
Sulfuric acid copper(2+) salt (1:1)	Flying Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	8370	NR	NR	ug/L	LAB	2007. Vutukuru, S.S., J.S. Pauleena, J.V. Rao, and Y. Anjaneyulu. Architectural Changes in the Gill Morphology of the Freshwater Fish, Esomus danricus as Potential Biomarkers of Copper Toxicity Using Automated Video Tracking System. Environ. Bioindic.2(1): 3-14.
Sulfuric acid copper(2+) salt (1:1)	Flying Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	1530	NR	NR	ug/L	LAB	2006. Vutukuru, S.S., S. Chintada, K. Radha Madhavi, J. Venkateswara Rao, and Y. Anjaneyulu. Acute Effects of Copper on Superoxide Dismutase, Catalase and Lipid Peroxidation in the Freshwater Teleost Fish, Esomus danricus. Fish Physiol. Biochem.32(3): 221-229.
Sulfuric acid copper(2+) salt (1:1)	Flying Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NR	NR	ug/L	LAB	2007. Vutukuru, S.S., J.S. Pauleena, J.V. Rao, and Y. Anjaneyulu. Architectural Changes in the Gill Morphology of the Freshwater Fish, Esomus danricus as Potential Biomarkers of Copper Toxicity Using Automated Video Tracking System. Environ. Bioindic.2(1): 3-14.
Sulfuric acid copper(2+) salt (1:1)	Flying Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	1402	NR	NR	ug/L	LAB	2006. Vutukuru, S.S., S. Chintada, K. Radha Madhavi, J. Venkateswara Rao, and Y. Anjaneyulu. Acute Effects of Copper on Superoxide Dismutase, Catalase and Lipid Peroxidation in the Freshwater Teleost Fish, Esomus danricus. Fish Physiol. Biochem.32(3): 221-229.
Sulfuric acid copper(2+) salt (1:1)	Flying Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	1402	NR	NR	ug/L	LAB	2005. Vutukuru, S.S., C. Suma, K.R. Madhavi, Juveria, J.S. Pauleena, J.V. Rao, and Y. Anjaneyulu. Studies on the Development of Potential Biomarkers for Rapid Assessment of Copper Toxicity to Freshwater Fish Using Esomus danricus as Model. Int. J. Environ. Res. Public Health2(1): 63-73.
Sulfuric acid copper(2+) salt (1:1)	Flying Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	5500	NR	NR	ug/L	LAB	2007. Vutukuru, S.S., J.S. Pauleena, J.V. Rao, and Y. Anjaneyulu. Architectural Changes in the Gill Morphology of the Freshwater Fish, Esomus danricus as Potential Biomarkers of Copper Toxicity Using Automated Video Tracking System. Environ. Bioindic.2(1): 3-14.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC10	Not Reported	T	12	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC10	Not Reported	T	12	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC10	Not Reported	T	12	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC10	Not Reported	T	12	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC10	Not Reported	T	17	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC10	Not Reported	T	19	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC25	Not Reported	T	13	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC25	Not Reported	T	13	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC25	Not Reported	T	15	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC25	Not Reported	T	15	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC25	Not Reported	T	15	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	IC25	Not Reported	T	15	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	LOEC	Not Reported	T	9.3	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	LOEC	Not Reported	T	11	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	MATC	Not Reported	T	7.1	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	MATC	Not Reported	T	8.5	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	NOEC	Not Reported	T	6.5	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	NOEC	Not Reported	T	6.5	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Growth	NOEC	Not Reported	T	6.5	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	IC10	Not Reported	T	7.1	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	IC10	Not Reported	T	7	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	IC25	Not Reported	T	8.1	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	IC25	Not Reported	T	8	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	LOEC	Not Reported	T	9.3	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	LOEC	Not Reported	T	11	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	LOEC	Not Reported	T	10.6	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	LOEC	Not Reported	T	9.3	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	MATC	Not Reported	T	7.1	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	MATC	Not Reported	T	8.5	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	NOEC	Not Reported	T	6.5	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	NOEC	Not Reported	T	6.5	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	28.3	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Fountain Darter	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	39.8	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Giant Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1982. Saxena, A.B., D.S. Rao, and Z.U. Khan. Studies on the Acute Toxicities of Copper, Mercury, and Cadmium to Danio malabaricus and Puntius ticto. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control17(5): 657-665.
Nitric acid, Copper(2+) salt	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	1400*	NA	NR	ug/L	LAB	1980. Mishra, S., and A.K. Srivastava. The Acute Toxic Effects of Copper on the Blood of a Teleost. Ecotoxicol. Environ. Saf.4(2): 191-194.
Nitric acid, Copper(2+) salt	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	1400*	NA	NR	ug/L	LAB	1980. Mishra, S., and A.K. Srivastava. The Acute Toxic Effects of Copper on the Blood of a Teleost. Ecotoxicol. Environ. Saf.4(2): 191-194.
Sulfuric acid copper(2+) salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NR	NR	ug/L	LAB	1992. Pande, R.K., and G.K. Shukla. Study of Acute Toxicity Dose of Herbicide, CuSO4.5H2O; Agrochemical, NPK; and Chemotherapeutics like Formalin and KMnO4 on Mystus vittatus and Colisa fasciatus. Z. Angew. Zool.79(2): 221-241.
Sulfuric acid copper(2+) salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NR	NR	ug/L	LAB	1992. Pande, R.K., and G.K. Shukla. Study of Acute Toxicity Dose of Herbicide, CuSO4.5H2O; Agrochemical, NPK; and Chemotherapeutics like Formalin and KMnO4 on Mystus vittatus and Colisa fasciatus. Z. Angew. Zool.79(2): 221-241.
Sulfuric acid copper(2+) salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	1992. Pande, R.K., and G.K. Shukla. Study of Acute Toxicity Dose of Herbicide, CuSO4.5H2O; Agrochemical, NPK; and Chemotherapeutics like Formalin and KMnO4 on Mystus vittatus and Colisa fasciatus. Z. Angew. Zool.79(2): 221-241.
Sulfuric acid copper(2+) salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	1992. Pande, R.K., and G.K. Shukla. Study of Acute Toxicity Dose of Herbicide, CuSO4.5H2O; Agrochemical, NPK; and Chemotherapeutics like Formalin and KMnO4 on Mystus vittatus and Colisa fasciatus. Z. Angew. Zool.79(2): 221-241.
Sulfuric acid copper(2+) salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	1994. Pande, R.K., and G.K. Shukla. Acute Toxicity and Efficacy of Herbicide CuSO4-5H2O, Used in Aquaculture, when Applied to Waters of Different Quality on Certain Fresh Water Teleosts. Z. Angew. Zool.80(3): 297-311.
Sulfuric acid copper(2+) salt (1:1)	Gila Topminnow	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Gila Topminnow	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Gila Topminnow	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Copper chloride (CuCl2)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	84600	NA	NR	ug/L	LAB	1989. Hartwell, S.I., J.H. Jin, D.S. Cherry, and J.,Jr. Cairns. Toxicity Versus Avoidance Response of Golden Shiner, Notemigonus crysoleucas, to Five Metals. J. Fish Biol.35(3): 447-456.
Sulfuric acid copper(2+) salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000*	NA	NR	ug/L	LAB	1971. Lewis, S.D., and W.M. Lewis. The Effect of Zinc and Copper on the Osmolality of Blood Serum of the Channel Catfish, Ictalurus punctatus Rafinesque, and Golden Shiner, Notemigonus crysoleucas Mitchill. Trans. Am. Fish. Soc.100(4): 639-643.
Copper chloride (CuCl2)	Goldfish	Fish	Fresh	Growth	NOEC	Whole Organism	T	90	NR	NR	ug	LAB	1970. Life, J.S.. Metabolism and Pharmacodynamics of Copper (Cu++) in the Goldfish (Carassius auratus). Ph.D.Thesis, University of Michigan, MI: 117 p..
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	440	NR	NR	ug/L	LAB	1995. Hossain, M.A., M. Shariff, A.T. Law, and I. Patimah. Median Lethal Concentration of Copper to Goldfish Carassius auratus Linnaeus. Pak. J. Sci. Ind. Res.38(5-6): 196-199.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1150	NA	NR	ug/L	LAB	1980. Tsai, C.F., and J.A. McKee. Acute Toxicity to Goldfish of Mixtures of Chloramines, Copper, and Linear Alkylate Sulfonate. Trans. Am. Fish. Soc.109(1): 132-141.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	365	NR	NR	ug/L	LAB	1993. Ling, K.H., Y.M. Sin, and T.J. Lam. Effect of Copper Sulphate on Ichthyophthiriasis (White Spot Disease) in Goldfish (Carassius auratus). Aquaculture118(1-2): 23-35.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	360	NR	NR	ug/L	LAB	1995. Hossain, M.A., M. Shariff, A.T. Law, and I. Patimah. Median Lethal Concentration of Copper to Goldfish Carassius auratus Linnaeus. Pak. J. Sci. Ind. Res.38(5-6): 196-199.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	F	4490	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1147	NR	NR	ug/L	LAB	1978. Tsai, C.F., and J.A. McKee. The Toxicity to Goldfish of Mixtures of Chloramines, LAS and Copper. Tech.Rep.No.44, Water Resour.Res.Ctr., Univ.of Maryland, College Park, MD: 31 p..
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	640	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1510	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2700	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	610	NA	NR	ug/L	LAB	1980. Tsai, C.F., and J.A. McKee. Acute Toxicity to Goldfish of Mixtures of Chloramines, Copper, and Linear Alkylate Sulfonate. Trans. Am. Fish. Soc.109(1): 132-141.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	355	NR	NR	ug/L	LAB	1993. Ling, K.H., Y.M. Sin, and T.J. Lam. Effect of Copper Sulphate on Ichthyophthiriasis (White Spot Disease) in Goldfish (Carassius auratus). Aquaculture118(1-2): 23-35.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1995. Hossain, M.A., M. Shariff, A.T. Law, and I. Patimah. Median Lethal Concentration of Copper to Goldfish Carassius auratus Linnaeus. Pak. J. Sci. Ind. Res.38(5-6): 196-199.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	607	NR	NR	ug/L	LAB	1978. Tsai, C.F., and J.A. McKee. The Toxicity to Goldfish of Mixtures of Chloramines, LAS and Copper. Tech.Rep.No.44, Water Resour.Res.Ctr., Univ.of Maryland, College Park, MD: 31 p..
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1980. Tsai, C.F., and J.A. McKee. Acute Toxicity to Goldfish of Mixtures of Chloramines, Copper, and Linear Alkylate Sulfonate. Trans. Am. Fish. Soc.109(1): 132-141.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	301	NR	NR	ug/L	LAB	1993. Ling, K.H., Y.M. Sin, and T.J. Lam. Effect of Copper Sulphate on Ichthyophthiriasis (White Spot Disease) in Goldfish (Carassius auratus). Aquaculture118(1-2): 23-35.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	5200	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NR	NR	ug/L	LAB	1995. Hossain, M.A., M. Shariff, A.T. Law, and I. Patimah. Median Lethal Concentration of Copper to Goldfish Carassius auratus Linnaeus. Pak. J. Sci. Ind. Res.38(5-6): 196-199.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	303	NR	NR	ug/L	LAB	1978. Tsai, C.F., and J.A. McKee. The Toxicity to Goldfish of Mixtures of Chloramines, LAS and Copper. Tech.Rep.No.44, Water Resour.Res.Ctr., Univ.of Maryland, College Park, MD: 31 p..
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1980. Tsai, C.F., and J.A. McKee. Acute Toxicity to Goldfish of Mixtures of Chloramines, Copper, and Linear Alkylate Sulfonate. Trans. Am. Fish. Soc.109(1): 132-141.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	288	NR	NR	ug/L	LAB	1993. Ling, K.H., Y.M. Sin, and T.J. Lam. Effect of Copper Sulphate on Ichthyophthiriasis (White Spot Disease) in Goldfish (Carassius auratus). Aquaculture118(1-2): 23-35.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1995. Hossain, M.A., M. Shariff, A.T. Law, and I. Patimah. Median Lethal Concentration of Copper to Goldfish Carassius auratus Linnaeus. Pak. J. Sci. Ind. Res.38(5-6): 196-199.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	F	1380	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	1978. Tsai, C.F., and J.A. McKee. The Toxicity to Goldfish of Mixtures of Chloramines, LAS and Copper. Tech.Rep.No.44, Water Resour.Res.Ctr., Univ.of Maryland, College Park, MD: 31 p..
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NR	NR	ug/L	LAB	1995. Hossain, M.A., M. Shariff, A.T. Law, and I. Patimah. Median Lethal Concentration of Copper to Goldfish Carassius auratus Linnaeus. Pak. J. Sci. Ind. Res.38(5-6): 196-199.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	276	NR	NR	ug/L	LAB	1993. Ling, K.H., Y.M. Sin, and T.J. Lam. Effect of Copper Sulphate on Ichthyophthiriasis (White Spot Disease) in Goldfish (Carassius auratus). Aquaculture118(1-2): 23-35.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	5200	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	5200	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	268	NR	NR	ug/L	LAB	1993. Ling, K.H., Y.M. Sin, and T.J. Lam. Effect of Copper Sulphate on Ichthyophthiriasis (White Spot Disease) in Goldfish (Carassius auratus). Aquaculture118(1-2): 23-35.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	94	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	43	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	36	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC90	Not Reported	T	6900	NA	NR	ug/L	LAB	1974. Lemma, A., and P. Yau. Studies on the Molluscicidal Properties of Endod (Phytolacca dodecandra): II. Comparative Toxicity of Various Molluscicides to Fish and Snails. Ethiop. Med. J.12(3): 109-114.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Ling, K.H., Y.M. Sin, and T.J. Lam. Effect of Copper Sulphate on Ichthyophthiriasis (White Spot Disease) in Goldfish (Carassius auratus). Aquaculture118(1-2): 23-35.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	400*	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	4000*	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	750	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	750	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	82.6	NR	NR	ug/L	LAB	1998. Jacobson, S.V., and R. Reimschuessel. Modulation of Superoxide Production in Goldfish (Carassius auratus) Exposed to and Recovering from Sublethal Copper Levels. Fish Shellfish Immunol.8(4): 245-259.
Sulfuric acid copper(2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	78.8	NR	NR	ug/L	LAB	1998. Jacobson, S.V., and R. Reimschuessel. Modulation of Superoxide Production in Goldfish (Carassius auratus) Exposed to and Recovering from Sublethal Copper Levels. Fish Shellfish Immunol.8(4): 245-259.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	EC50	Not Reported	T	170	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	620	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	NA	135	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	NA	590	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	108	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Zhang, F., Y. Zhou, and R. Zhou. Toxicities of Two Metals and Two Pesticides to Grass Carps at Different Development Stages. Huanjing Kexue Xuebao8(1): 67-71.
Copper chloride (CuCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Wong, M.H., K.C. Luk, and K.Y. Choi. The Effects of Zinc and Copper Salts on Cyprinus carpio and Ctenopharyngodon idellus. Acta Anat.99(4): 450-454.
Sulfuric acid copper(2+) salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.
Sulfuric acid copper(2+) salt (1:1)	Green Sunfish	Fish	Fresh	Mortality	LC50	Not Reported	F	4050	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Green Sunfish	Fish	Fresh	Mortality	LC50	Not Reported	F	4290	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Green Sunfish	Fish	Fresh	Mortality	LC50	Not Reported	F	3400	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Green Sunfish	Fish	Fresh	Mortality	LC50	Not Reported	F	3510	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Green Sunfish	Fish	Fresh	Mortality	NR	Not Reported	T	164	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Green Sunfish	Fish	Fresh	Reproduction	NR		T	164	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Greenthroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Greenthroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Greenthroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Greenthroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	260	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	230		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.
Sulfuric acid copper(2+) salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	240		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.
Sulfuric acid copper(2+) salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	260		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.
Sulfuric acid copper(2+) salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	320		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.
Sulfuric acid copper(2+) salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	380		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.
Sulfuric acid copper(2+) salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	560		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.
Sulfuric acid copper(2+) salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	1380*	NA	NR	ug/L	LAB	1986. Bengeri, K.V., K.M. Shivaraj, and H.S. Patil. Toxicity of Copper Sulfate to a Freshwater Fish Lepidocephalichthyes guntea. Comp. Physiol. Ecol.11(3): 99-102.
Sulfuric acid copper(2+) salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	840*	NA	NR	ug/L	LAB	1986. Bengeri, K.V., K.M. Shivaraj, and H.S. Patil. Toxicity of Copper Sulfate to a Freshwater Fish Lepidocephalichthyes guntea. Comp. Physiol. Ecol.11(3): 99-102.
Sulfuric acid copper(2+) salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	1040*	NA	NR	ug/L	LAB	1986. Bengeri, K.V., K.M. Shivaraj, and H.S. Patil. Toxicity of Copper Sulfate to a Freshwater Fish Lepidocephalichthyes guntea. Comp. Physiol. Ecol.11(3): 99-102.
Sulfuric acid copper(2+) salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	560*	NA	NR	ug/L	LAB	1986. Bengeri, K.V., K.M. Shivaraj, and H.S. Patil. Toxicity of Copper Sulfate to a Freshwater Fish Lepidocephalichthyes guntea. Comp. Physiol. Ecol.11(3): 99-102.
Sulfuric acid copper(2+) salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	500*	NA	NR	ug/L	LAB	1986. Bengeri, K.V., K.M. Shivaraj, and H.S. Patil. Toxicity of Copper Sulfate to a Freshwater Fish Lepidocephalichthyes guntea. Comp. Physiol. Ecol.11(3): 99-102.
Sulfuric acid copper(2+) salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	980*	NA	NR	ug/L	LAB	1986. Bengeri, K.V., K.M. Shivaraj, and H.S. Patil. Toxicity of Copper Sulfate to a Freshwater Fish Lepidocephalichthyes guntea. Comp. Physiol. Ecol.11(3): 99-102.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC0	Not Reported	T	8500*	NA	NR	ug/L	LAB	1975. Muraleedharan, K., S.P. Kumar, K.S. Hedge, and V.S. Alwar. Relative Efficiency of Copper Sulphate, Sodium Pentachlorophenate and Bayluscide Against Freshwater Snail Indoplanorbis exustus. Indian J. Anim. Sci.45(10): 739-743.
Copper	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	112	NA	NR	ug/L	LAB	1976. Chynoweth, D.P., J.A. Black, and K.H. Mancy. Effect of Organic Pollutants on Copper Toxicity to Fish. In: Toxicity to Biota of Metal Forms in Natural Water, Int.Joint Comm., Windsor, Ontario, Canada: 145-158.
Copper	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	138	NA	NR	ug/L	LAB	1976. Chynoweth, D.P., J.A. Black, and K.H. Mancy. Effect of Organic Pollutants on Copper Toxicity to Fish. In: Toxicity to Biota of Metal Forms in Natural Water, Int.Joint Comm., Windsor, Ontario, Canada: 145-158.
Copper chloride (CuCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	66.4*	NA	NR	ug/L	LAB	1975. Anderson, P.D., and L.J. Weber. Toxic Response as a Quantitative Function of Body Size. Toxicol. Appl. Pharmacol.33(3): 471-483.
Nitric acid, Copper(2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	112	NR	NR	ug/L	LAB	1974. Black, J.A.. The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes reticulatus). Ph.D.Thesis, Univ.of Michigan, Ann Arbor, MI: 129 p..
Nitric acid, Copper(2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	138	NR	NR	ug/L	LAB	1974. Black, J.A.. The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes reticulatus). Ph.D.Thesis, Univ.of Michigan, Ann Arbor, MI: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	930		NC	ug/L	LAB	2001. Khunyakari, R.P., V. Tare, and R.N. Sharma. Effects of Some Trace Heavy Metals on Poecilia reticulata (Peters).. J. Environ. Biol.22(2): 141-144.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	15360	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	17000	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	20480	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	20480	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	7940	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	2110	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1170	NR	NR	ug/L	LAB	2009. Park, K., and G.J. Heo. Acute and Subacute Toxicity of Copper Sulfate Pentahydrate (CuSO45.H2O) in the Guppy (Poecilia reticulata). J. Vet. Med. Sci.71(3): 333-336.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	87000	NA	NR	ug/L	LAB	1991. Yarzhombek, A.A., A.E. Mikulin, and A.N. Zhdanova. Toxicity of Substances in Relation to Form of Exposure. J. Ichthyol.31(7): 99-106.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	10070	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	11600	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	20480	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	2580	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Studies on the Acute Toxicity of Copper and Mercury Alone and in Combination to the Common Guppy Poecilia reticulata (Peters). Arch. Hydrobiol.110(2): 303-314.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	3970	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	8660	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1570	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	3960	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Chelating Agent EDTA Decreases the Toxicity of Copper to Fish. Curr. Sci. (Bangalore)50(5): 246-248.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	37000	NA	NR	ug/L	LAB	1981. Khangarot, B.S., V.S. Durve, and V.K. Rajbanshi. Toxicity of Interactions of Zinc-Nickel, Copper-Nickel and Zinc-Nickel-Copper to a Freshwater Teleost, Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 495-503.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Studies on the Acute Toxicity of Copper and Mercury Alone and in Combination to the Common Guppy Poecilia reticulata (Peters). Arch. Hydrobiol.110(2): 303-314.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	3380	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	4700	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	5990	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	8240	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1172	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	710		NR	ug/L	LAB	2001. Khunyakari, R.P., V. Tare, and R.N. Sharma. Effects of Some Trace Heavy Metals on Poecilia reticulata (Peters).. J. Environ. Biol.22(2): 141-144.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	3380	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Chelating Agent EDTA Decreases the Toxicity of Copper to Fish. Curr. Sci. (Bangalore)50(5): 246-248.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1810	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	2920	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	3440	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	5260	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1230	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1940	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	2290	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	3440	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Complexing Agents on the Acute Toxicity of Copper to Common Guppy Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 505-509.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	986	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Studies on the Acute Toxicity of Copper and Mercury Alone and in Combination to the Common Guppy Poecilia reticulata (Peters). Arch. Hydrobiol.110(2): 303-314.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	764	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1230	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Chelating Agent EDTA Decreases the Toxicity of Copper to Fish. Curr. Sci. (Bangalore)50(5): 246-248.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	141000*	NA	NR	ug/L	LAB	1980. Deshmukh, S.S., and V.B. Marathe. Size Related Toxicity of Copper and Mercury to Lebistes reticulatus (Peter), Labeo rohita (Ham.) and Cyprinus carpio Linn. Indian J. Exp. Biol.18: 421-423.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	47000*	NA	NR	ug/L	LAB	1980. Deshmukh, S.S., and V.B. Marathe. Size Related Toxicity of Copper and Mercury to Lebistes reticulatus (Peter), Labeo rohita (Ham.) and Cyprinus carpio Linn. Indian J. Exp. Biol.18: 421-423.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	80700*	NA	NR	ug/L	LAB	1980. Deshmukh, S.S., and V.B. Marathe. Size Related Toxicity of Copper and Mercury to Lebistes reticulatus (Peter), Labeo rohita (Ham.) and Cyprinus carpio Linn. Indian J. Exp. Biol.18: 421-423.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	490	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Studies on the Acute Toxicity of Copper and Mercury Alone and in Combination to the Common Guppy Poecilia reticulata (Peters). Arch. Hydrobiol.110(2): 303-314.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	NR	Mortality	LC50	Not Reported	T	1140*	NA	NR	ug/L	LAB	1980. Svobodova, Z.. Acute Toxicity of Pesticides to Fish (Akutni Toxicita Pesticidu pro Ryby). Agrochemia (Bratisl.)20(11): 328-332.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	NR	Mortality	LC50	Not Reported	T	22	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Study of the Toxicity of Mercury, Copper, Zinc and Trinitroresorcinol on Lebistes reticulateus, Method of Survival (Ispitivanje Toksicnosti Zive, Bakra, Cinka i Trinitrorezorcina na Lebistes reticulatus. Bioogled Kratko. Arh. Hig. Rada Toksikol.28(1): 3-16.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	1130	NA	NR	ug/L	LAB	1971. Minicucci, D.D.. Flow Effects in Aquatic Bioassays (The Toxicity of Copper at Various Flow Rates to the Guppy, Lebistes reticulatus). M.S.Thesis, Univ.of Michigan, Ann Arbor, MI: 86 p..
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	1370	NA	NR	ug/L	LAB	1971. Minicucci, D.D.. Flow Effects in Aquatic Bioassays (The Toxicity of Copper at Various Flow Rates to the Guppy, Lebistes reticulatus). M.S.Thesis, Univ.of Michigan, Ann Arbor, MI: 86 p..
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	1680	NA	NR	ug/L	LAB	1971. Minicucci, D.D.. Flow Effects in Aquatic Bioassays (The Toxicity of Copper at Various Flow Rates to the Guppy, Lebistes reticulatus). M.S.Thesis, Univ.of Michigan, Ann Arbor, MI: 86 p..
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	930	NA	NR	ug/L	LAB	1971. Minicucci, D.D.. Flow Effects in Aquatic Bioassays (The Toxicity of Copper at Various Flow Rates to the Guppy, Lebistes reticulatus). M.S.Thesis, Univ.of Michigan, Ann Arbor, MI: 86 p..
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	130	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	41320*	NA	NR	ug/L	LAB	1979. Furmanska, M.. Studies of the Effect of Copper, Zinc, and Iron on the Biotic Components of Aquatic Ecosystems. Pol. Arch. Hydrobiol.26(1-2): 213-220.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	73	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	36	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LC99.5	Not Reported	T	15000	NR	NR	ug/L	LAB	1967. Jobin, W.R., and G.O. Unrau. Chemical Control of Australorbis glabratus. Public Health Rep82(1): 63-71.
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	LD50	Not Reported	T	3E-07	NR	NR	mol/L	LAB	1956. Shaw, W.H.R., and B.R. Lowrance. Bioassay for the Estimation of Metal Ions. Anal. Chem. (Wash.)28: 1164-1166.
Copper	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Mancy, K.H., and H.E. Allen. A Controlled Bioassay System for Measuring Toxicity of Heavy Metals. Environ.Res.Lab.-Duluth, MN, Office of Res.and Develop., Duluth, MN Contract Number 14-12-591: 111 p..
Copper	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Mancy, K.H., and H.E. Allen. A Controlled Bioassay System for Measuring Toxicity of Heavy Metals. Environ.Res.Lab.-Duluth, MN, Office of Res.and Develop., Duluth, MN Contract Number 14-12-591: 111 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Mancy, K.H., and H.E. Allen. A Controlled Bioassay System for Measuring Toxicity of Heavy Metals. Environ.Res.Lab.-Duluth, MN, Office of Res.and Develop., Duluth, MN Contract Number 14-12-591: 111 p..
Sulfuric acid copper(2+) salt (1:1)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	1170	NR	NR	ug/L	LAB	2009. Park, K., and G.J. Heo. Acute and Subacute Toxicity of Copper Sulfate Pentahydrate (CuSO45.H2O) in the Guppy (Poecilia reticulata). J. Vet. Med. Sci.71(3): 333-336.
Copper	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	343	NR	NR	ug/L	LAB	1977. Mancy, K.H., and H.E. Allen. A Controlled Bioassay System for Measuring Toxicity of Heavy Metals. Environ.Res.Lab.-Duluth, MN, Office of Res.and Develop., Duluth, MN Contract Number 14-12-591: 111 p..
Sulfuric acid copper(2+) salt (1:1)	Hill Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3400	NR	NR	ug/L	LAB	2007. Bisht, I., and S.K. Agarwal. Cytomorphological and Histochemical Changes in Mucous Cells of General Body Epidermis of Barilius vagra (Cyprinidae, Pisces) Following Exposure to a Herbicide - Blue Vitrol (CuSO4): A Statistical Analysis. J. Exp. Zool. India10(1): 27-36.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Growth	NR	Not Reported	T	750	NA	NR	ug/L	LAB	1995. James, R., K. Sampath, V. Sivakumar, S. Babu, and P. Shanmuganandam. Toxic Effects of Copper and Mercury on Food Intake, Growth and Proximate Chemical Composition in Heteropneustes fossilis. J. Environ. Biol.16(1): 1-6.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC100	Not Reported	T	192000	NA	NR	ug/L	LAB	1994. Kumar, A.. Toxicity and Behavioural Responses of Heteropneustes fossilis (Bloch) to Copper Sulphate. CDROM, Prepared by SilverPlatter Information Inc. , Updated to 6/97, AN3732550 (ABS) / J. Aquat. Biol. Fish.1(1): 15-18.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	14100	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	28390	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	12920	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	14830	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	11090	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	12400	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1995. James, R., and K. Sampath. Sublethal Effects of Mixtures of Copper and Ammonia on Selected Biochemical and Physiological Parameters in the Catfish Heteropneustes fossilis (Bloch). Bull. Environ. Contam. Toxicol.55(2): 187-194.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	22010	NA	NR	ug/L	LAB	1979. Gupta, A.K., and V.K. Rajbanshi. Pathological Changes Resulting from Bioassay of Copper to Heteropneustes fossilis (Bloch). In: S.R.Verma, A.K.Tyagi, and S.K.Bansal (Eds.), Environmental Biology: Proc.Symp.Environ.Biol., Muzaffarnager, India: 167-172.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1995. James, R., K. Sampath, V. Sivakumar, S. Babu, and P. Shanmuganandam. Toxic Effects of Copper and Mercury on Food Intake, Growth and Proximate Chemical Composition in Heteropneustes fossilis. J. Environ. Biol.16(1): 1-6.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	10490	NA	NR	ug/L	LAB	1988. Rajbanshi, V.K., and A.K. Gupta. Alterations in the Architecture of the Gill Surface Produced by Water-Borne Copper in Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.16(3): 325-331.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	10490	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	9440	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LETC	Not Reported	T	7200	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LETC	Not Reported	T	8170	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	MATC	Not Reported	T	6700	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	MATC	Not Reported	T	7050	NA	NR	ug/L	LAB	1991. Gupta, A.K., and V.K. Rajbanshi. Toxicity of Copper and Cadmium to Heteropneustes fossilis (Bloch). Acta Hydrochim. Hydrobiol.19(3): 331-340.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Bakshi, N.. Toxicity Effect of Copper on the Survival, Behaviour and Histopathological Changes in the Liver, Intestine and Kidney in a Freshwater Teleost, Heteropneustes fossilis (Bloch). Uttar Pradesh J. Zool.11(2): 117-120.
Sulfuric acid copper(2+) salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	75000	NA	NR	ug/L	LAB	1991. Bakshi, N.. Toxicity Effect of Copper on the Survival, Behaviour and Histopathological Changes in the Liver, Intestine and Kidney in a Freshwater Teleost, Heteropneustes fossilis (Bloch). Uttar Pradesh J. Zool.11(2): 117-120.
Nitric acid, Copper(2+) salt	Indian Freshwater Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1989. Gaikwad, S.A.. Effects of Mixture and Three Individual Heavy Metals on Susceptibility of Three Fresh Water Fishes. Pollut. Res.8(1): 33-35.
Sulfuric acid copper(2+) salt (1:1)	Japanese Eel	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Japanese Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	4200	NA	NR	ug/L	LAB	1988. Yokoyama, T., H. Saka, S. Fujita, and Y. Nishiuchi. Sensitivity of Japanese Eel, Anguilla japonica, to 68 Kinds of Agricultural Chemicals. Bull.Agric.Chem.Insp.Stn.(Tokyo)28: 26-33.
Sulfuric acid copper(2+) salt (1:1)	Japanese Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1988. Yokoyama, T., H. Saka, S. Fujita, and Y. Nishiuchi. Sensitivity of Japanese Eel, Anguilla japonica, to 68 Kinds of Agricultural Chemicals. Bull.Agric.Chem.Insp.Stn.(Tokyo)28: 26-33.
Sulfuric acid copper(2+) salt (1:1)	Japanese Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.
Sulfuric acid copper(2+) salt (1:1)	Japanese Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.
Sulfuric acid copper(2+) salt (1:1)	Japanese Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.
Copper chloride (CuCl2)	Japanese Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	750	NA	NR	ug/L	LAB	1984. Mushiake, K., K. Muroga, and T. Nakai. Increased Susceptibility of Japanese Eel Anguilla japonica to Edwardsiella tarda and Pseudomonas anguilliseptica Following Exposure to Copper. Nippon Suisan Gakkaishi50(11): 1797-1801.
Copper chloride (CuCl2)	Japanese Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	340	NA	NR	ug/L	LAB	1984. Mushiake, K., K. Muroga, and T. Nakai. Increased Susceptibility of Japanese Eel Anguilla japonica to Edwardsiella tarda and Pseudomonas anguilliseptica Following Exposure to Copper. Nippon Suisan Gakkaishi50(11): 1797-1801.
Copper chloride (CuCl2)	Japanese Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	550	NA	NR	ug/L	LAB	1984. Mushiake, K., K. Muroga, and T. Nakai. Increased Susceptibility of Japanese Eel Anguilla japonica to Edwardsiella tarda and Pseudomonas anguilliseptica Following Exposure to Copper. Nippon Suisan Gakkaishi50(11): 1797-1801.
Copper chloride (CuCl2)	Japanese Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	510	NA	NR	ug/L	LAB	1984. Mushiake, K., K. Muroga, and T. Nakai. Increased Susceptibility of Japanese Eel Anguilla japonica to Edwardsiella tarda and Pseudomonas anguilliseptica Following Exposure to Copper. Nippon Suisan Gakkaishi50(11): 1797-1801.
Sulfuric acid copper(2+) salt (1:1)	Johnny Darter	Fish	Fresh	Growth	NR		T	107	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Johnny Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	9300	D	830	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Johnny Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	D	660	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Johnny Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	6800	D	610	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Johnny Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	483	NA	NR	ug/L	LAB	1988. Lydy, M.J., and T.E. Wissing. Effect of Sublethal Concentrations of Copper on the Critical Thermal Maxima (CTMax) of the Fantail (Etheostoma flabellare) and Johnny (E. nigrum). Aquat. Toxicol.12(4): 311-322.
Sulfuric acid copper(2+) salt (1:1)	Johnny Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	493	NA	NR	ug/L	LAB	1988. Lydy, M.J., and T.E. Wissing. Effect of Sublethal Concentrations of Copper on the Critical Thermal Maxima (CTMax) of the Fantail (Etheostoma flabellare) and Johnny (E. nigrum). Aquat. Toxicol.12(4): 311-322.
Sulfuric acid copper(2+) salt (1:1)	Johnny Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	548	NA	NR	ug/L	LAB	1988. Lydy, M.J., and T.E. Wissing. Effect of Sublethal Concentrations of Copper on the Critical Thermal Maxima (CTMax) of the Fantail (Etheostoma flabellare) and Johnny (E. nigrum). Aquat. Toxicol.12(4): 311-322.
Sulfuric acid copper(2+) salt (1:1)	Johnny Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	602	NA	NR	ug/L	LAB	1988. Lydy, M.J., and T.E. Wissing. Effect of Sublethal Concentrations of Copper on the Critical Thermal Maxima (CTMax) of the Fantail (Etheostoma flabellare) and Johnny (E. nigrum). Aquat. Toxicol.12(4): 311-322.
Sulfuric acid copper(2+) salt (1:1)	Johnny Darter	Fish	Fresh	Mortality	NR	Not Reported	T	107	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Copper	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	33	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Copper	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	39	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Sulfuric acid copper(2+) salt (1:1)	Killifish, Topminnow Family	Fish	Fresh	Mortality	NR	Not Reported	T	330*	NA	NR	ug/L	LAB	1939. Schaut, G.G.. Fish Catastrophes During Droughts. J. Am. Water Works Assoc.31(5): 771-822.
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	390	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	550	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Lahontan Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Lake Trout, Siscowet	Fish	NR	Growth	NR	Whole Organism	T	22	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Lake Trout, Siscowet	Fish	NR	Growth	NR	Whole Organism	T	42.3	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	6970	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	6560	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	6560	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Sulfuric acid copper(2+) salt (1:1)	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	4800	NA	NR	ug/L	LAB	1974. Morgan, W.S.G., and P.C. Kuhn. A Method to Monitor the Effects of Toxicants upon Breathing Rate of Largemouth Bass (Micropterus salmoides Lacepede). Water Res.8(1): 67-77.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	1230	NA	NR	ug/L	LAB	1974. Morgan, W.S.G., and P.C. Kuhn. A Method to Monitor the Effects of Toxicants upon Breathing Rate of Largemouth Bass (Micropterus salmoides Lacepede). Water Res.8(1): 67-77.
Sulfuric acid copper(2+) salt (1:1)	Leon Springs Pupfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	2500000	NA	NR	ug/L	LAB	1988. Muniandy, S.. Effects of Copper Sulfate on Food Utilization, Growth and Conversion Efficiency of the Freshwater Fish Lepidocephalichthyes thermalis. Environ. Ecol.6(4): 968-971.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NR	NR	ug/L	LAB	1996. Geetha, R., A.K. Kumaragruru, and A.J. Thatheyus. Toxic Effects of the Heavy Metal Copper on the Fish Lepidocephalichthys thermalis in Short Term Exposures. Pollut. Res.15(2): 151-154.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	1580	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	980	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	NR	Not Reported	T	400	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	NR	Not Reported	T	1800	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	NR	Not Reported	T	1500	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500	NR	NR	ug/L	LAB	1996. Geetha, R., A.K. Kumaragruru, and A.J. Thatheyus. Toxic Effects of the Heavy Metal Copper on the Fish Lepidocephalichthys thermalis in Short Term Exposures. Pollut. Res.15(2): 151-154.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	130*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	64*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	510*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	32*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Loach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	260*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Longfin Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	860	NA	NR	ug/L	LAB	1978. Lewis, M.. Acute Toxicity of Copper, Zinc, and Manganese in Single and Mixed Salt Solutions to Juvenile Longfin Dace, Agosia chrysogaster. J. Fish Biol.13(6): 695-700.
Copper	Long-Nosed Siberian Sturgeon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Copper	Long-Nosed Siberian Sturgeon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Copper chloride (CuCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Copper chloride (CuCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	540	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Copper chloride (CuCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Copper chloride (CuCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Copper chloride (CuCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	490	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Sulfuric acid copper(2+) salt (1:1)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Sulfuric acid copper(2+) salt (1:1)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Sulfuric acid copper(2+) salt (1:1)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Sulfuric acid copper(2+) salt (1:1)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	40000	NA	NR	ug/L	LAB	1970. Akiyama, A.. Acute Toxicity of Two Organic Mercury Compounds to the Teleost, Oryzias latipes, in Different Stages of Development. Nippon Suisan Gakkaishi36(6): 563-570.
Sulfuric acid copper(2+) salt (1:1)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Sulfuric acid copper(2+) salt (1:1)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Sulfuric acid copper(2+) salt (1:1)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	620	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Sulfuric acid copper(2+) salt (1:1)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Hiraoka, Y., S. Ishizawa, T. Kamada, and H. Okuda. Acute Toxicity of 14 Different Kinds of Metals Affecting Medaka Fry. Hiroshima J. Med. Sci.34(3): 327-330.
Sulfuric acid copper(2+) salt (1:1)	Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	44	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Sulfuric acid copper(2+) salt (1:1)	Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	33.3	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Sulfuric acid copper(2+) salt (1:1)	Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	25.8	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Copper chloride (CuCl2)	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	N	LAB	1927. Carpenter, K.E.. The Lethal Action of Soluble Metallic Salts on Fishes. Br. J. Exp. Biol.4: 378-391.
Sulfuric acid copper(2+) salt (1:1)	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	N	LAB	1927. Carpenter, K.E.. The Lethal Action of Soluble Metallic Salts on Fishes. Br. J. Exp. Biol.4: 378-391.
Sulfuric acid copper(2+) salt (1:1)	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Sulfuric acid copper(2+) salt (1:1)	Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1700	NR	NR	ug/L	LAB	1999. Sanchez-Galan, S., A.R. Linde, and E. Garcia-Vazquez. Brown Trout and European Minnow as Target Species for Genotoxicity Tests: Differential Sensitivity to Heavy Metals. Ecotoxicol. Environ. Saf.43(3): 301-304.
Copper	Minnow,Carp Family	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1985. Romanenko, V.D., and N.Y. Yevtushenko. The Tissue Accumulation of Heavy Metals and Their Influence on the Biosynthesis in the Fish Organism. Symp. Biol. Hung.29: 299-312.
Sulfuric acid copper(2+) salt (1:1)	Minnow,Carp Family	Fish	NR	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	NR	1983. Gorovaya, S.L., and M.S. Borisova. Toxicity of Copper Sulfate to Carp Larva and Fodder Zooplankton. C. A. Sel. -Environ. Pollut.24: 1.
Copper chloride (CuCl)	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	FIELDA	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Sulfuric acid copper(2+) salt (1:1)	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	FIELDA	1968. Chu, K.Y., J. Massoud, and F. Arfaa. Comparative Studies of the Molluscicidal Effect of Cuprous Chloride and Copper Sulfate in Iran. Bull. W. H. O.39: 320-327.
Sulfuric acid copper(2+) salt (1:1)	Mojarra	Fish	Fresh	Mortality	LC50	Not Reported	T	2840	NR	NR	ug/L	LAB	1999. Lemus, M.J., and K.S. Chung. Effect of Temperature on Copper Toxicity, Accumulation and Purification in Tropical Fish Juveniles Petenia kraussii (Pisces: Cichlidae). Caribb. J. Sci.35(1-2): 64-69.
Sulfuric acid copper(2+) salt (1:1)	Mojarra	Fish	Fresh	Mortality	LC50	Not Reported	T	4850	NR	NR	ug/L	LAB	1999. Lemus, M.J., and K.S. Chung. Effect of Temperature on Copper Toxicity, Accumulation and Purification in Tropical Fish Juveniles Petenia kraussii (Pisces: Cichlidae). Caribb. J. Sci.35(1-2): 64-69.
Copper	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Copper	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Copper	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Copper	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	3500	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Copper	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Copper	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Copper	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Copper	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	900	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Sulfuric acid copper(2+) salt (1:1)	Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	110	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	420	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	800*	NA	NR	ug/L	LAB	1970. Milad, A.B., G. Tadros, A.F. Abdel Ghani, and G.E. Mawla. Laboratory Studies with the Molluscicide N-Tritylomorpholine on Lymnaea cailliaudi and L. alexandrina Snails, Intermediate Hosts of Fasciola Gigantic and Gambosia Fish. Proc. 9th Arab Annu. Vet. Congr. , Egypt. Vet. Med. Assoc. , Cairo, UAR: 217-225.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	EC50	Not Reported	T	5.3		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	EC50	Not Reported	T	37.2		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	LOEC	Not Reported	T	6.7		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	LOEC	Not Reported	T	57		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	MATC	Not Reported	T	4.4		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	MATC	Not Reported	T	38		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	NOEC	Not Reported	T	2.9		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	NOEC	Not Reported	T	25		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	NOEL	Not Reported	T	6.7		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	NOEL	Not Reported	T	57		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	4.4		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	4.5		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	39		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	12		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	144		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	17		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	19		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	45		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	574		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	83		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LOEC	Not Reported	T	6.7		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LOEC	Not Reported	T	57		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	MATC	Not Reported	T	4.4		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	MATC	Not Reported	T	4.4		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	MATC	Not Reported	T	38		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NOEC	Not Reported	T	2.9		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NOEC	Not Reported	T	25		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	14		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	230		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	27		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	54		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	6.7		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	12		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	14		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	190		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2.9		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	230		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	24		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	57		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	LOEL	Whole Organism	D	8.7	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	LOEL	Whole Organism	D	8.3	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	MATC	Whole Organism	D	5.9	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	MATC	Whole Organism	D	5.7	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	NOEL	Whole Organism	D	4	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	NOEL	Whole Organism	D	3.9	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LC50	Not Reported	D	6	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LC50	Not Reported	D	5	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LOEL	Not Reported	D	8.7	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LOEL	Not Reported	D	8.7	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LOEL	Not Reported	D	21.1	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	MATC	Not Reported	D	5.9	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	MATC	Not Reported	D	13.2	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NOEC	Not Reported	D	76.1	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NOEL	Not Reported	D	4	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NOEL	Not Reported	D	4	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NOEL	Not Reported	D	8.3	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	22.3	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	21.1	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	LOEC	Whole Organism	T	75	NR	NR	ug/L	LAB	2007. Wu, S.M., Y.C. Ho, and M.J. Shih. Effects of Ca2+ or Na+ on Metallothionein Expression in Tilapia Larvae (Oreochromis mossambicus) Exposed to Cadmium or Copper. Arch. Environ. Contam. Toxicol.52(2): 229-234.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	LOEC	Whole Organism	T	75	NR	NR	ug/L	LAB	2007. Wu, S.M., Y.C. Ho, and M.J. Shih. Effects of Ca2+ or Na+ on Metallothionein Expression in Tilapia Larvae (Oreochromis mossambicus) Exposed to Cadmium or Copper. Arch. Environ. Contam. Toxicol.52(2): 229-234.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC16	Not Reported	T	790		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Copper	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	590	NA	NR	ug/L	LAB	1991. Rajkumar, R., and S.S.M. Das. Effect of Copper intoxication on Muscle Glycogen Levels in Oreochromis mossambica. Environ. Ecol.9(1): 1-3.
Copper	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	440	NA	NR	ug/L	LAB	1991. Rajkumar, R., and S.S.M. Das. Effect of Copper intoxication on Muscle Glycogen Levels in Oreochromis mossambica. Environ. Ecol.9(1): 1-3.
Copper	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NR	NR	ug/L	LAB	1998. Lam, K.L., P.W. Ko, J.K.Y. Wong, and K.M. Chan. Metal Toxicity and Metallothionein Gene Expression Studies in Common Carp and Tilapia. Mar. Environ. Res.46(1-5): 563-566.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1991. Rajkumar, R., and S.S.M. Das. Effect of Copper intoxication on Muscle Glycogen Levels in Oreochromis mossambica. Environ. Ecol.9(1): 1-3.
Copper	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1991. Rajkumar, R., and S.S.M. Das. Effect of Copper intoxication on Muscle Glycogen Levels in Oreochromis mossambica. Environ. Ecol.9(1): 1-3.
Copper	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	4270	NA	NR	ug/L	LAB	1998. James, R., K. Sampath, and P. Selvamani. Effect of EDTA on Reduction of Copper Toxicity in Oreochromis mossambicus (Peters). Bull. Environ. Contam. Toxicol.60: 487-493.
Copper	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1991. Rajkumar, R., and S.S.M. Das. Effect of Copper intoxication on Muscle Glycogen Levels in Oreochromis mossambica. Environ. Ecol.9(1): 1-3.
Copper	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NR	NR	ug/L	LAB	1998. Lam, K.L., P.W. Ko, J.K.Y. Wong, and K.M. Chan. Metal Toxicity and Metallothionein Gene Expression Studies in Common Carp and Tilapia. Mar. Environ. Res.46(1-5): 563-566.
Copper	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1991. Rajkumar, R., and S.S.M. Das. Effect of Copper intoxication on Muscle Glycogen Levels in Oreochromis mossambica. Environ. Ecol.9(1): 1-3.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	11740	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	5930	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	4080	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	5580	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	3380	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	3830	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	3000*	NA	NR	ug/L	LAB	1984. Balavenkatasubbaiah, M., A.U. Rani, K. Geethanjali, K.R. Purushotham, and R. Ramamurthi. Effect of Cupric Chloride on Oxidative Metabolism in the Freshwater Teleost, Tilapia mossambica. Ecotoxicol. Environ. Saf.8(3): 289-293.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	2950	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	3360	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	2830	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	3030	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1987. Rani, A.U., and R. Ramamurthi. Toxicity of Copper to Some Freshwater Organisms. Environ. Ecol.5(2): 407-408.
Nitric acid, Copper(2+) salt	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1989. Gaikwad, S.A.. Effects of Mixture and Three Individual Heavy Metals on Susceptibility of Three Fresh Water Fishes. Pollut. Res.8(1): 33-35.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	2007		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	4270		NC	ug/L	LAB	2004. James, R., K. Sampath, R. Jeyamary, and P. Selvamani. Effect of Zeolite (Sodium Aluminosilicate) on the Removal of Copper from Water and Fish and an Improvement of RNA:DNA Ratio in Oreochromis mossambicus (Peters). Int. J. Ecohydrol. Hydrobiol.4(1): 57-65.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	4270		NC	ug/L	LAB	2000. James, R., K. Sampath, and P. Selvamani. Effect of Ion-Exchanging Agent, Zeolite on Removal of Copper in Water and Improvement of Growth in Oreochromis mossambicus (Peters). Asian Fish. Sci.13(4): 317-325.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	4270		NC	ug/L	LAB	2003. James, R., and K. Sampath. Removal of Copper Toxicity by Zeolite in Java Tilapia Oreochromis mossambicus (Peters). Bull. Environ. Contam. Toxicol.71(6): 1184-1191.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., and A.B. Saksena. The Acute Toxicity of Some Heavy Metals to Tilapia mossambica (Peters). Aqua Sci. Tech. Reviews (India)1: 19-20.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1980. Qureshi, S.A., and A.B. Saksena. The Acute Toxicity of Some Heavy Metals to Tilapia mossambica (Peters). Aqua Sci. Tech. Reviews (India)1: 19-20.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	NR	NR	ug/L	LAB	1998. Jafri, S.I.H., and S.A. Shaikh. Toxicity of Copper to Tilapia, Oreochromis mossambicus (Teleostei): Histopathology of Liver and Testis. Pak. J. Zool.30(3): 167-171.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1992. James, R., K. Sampath, and K.P. Ponmani. Effect of Metal Mixtures on Activity of Two Respiratory Enzymes and Their Recovery in Oreochromis mossambicus (Peters). Indian J. Exp. Biol.30(6): 496-499.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	6500	NR	NR	ug/L	LAB	1998. De Vera, M.P., and G.N. Pocsidio. Potential Protective Effect of Calcium Carbonate as Liming Agent Against Copper Toxicity in the African Tilapia Oreochromis mossambicus. Sci. Total Environ.214(1-3): 193-202.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	14000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1980. Qureshi, S.A., and A.B. Saksena. The Acute Toxicity of Some Heavy Metals to Tilapia mossambica (Peters). Aqua Sci. Tech. Reviews (India)1: 19-20.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	53000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC84	Not Reported	T	2600		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	2003. Wu, S.M., K.J. Jong, and S.Y. Kuo. Effects of Copper Sulfate on Ion Balance and Growth in Tilapia Larvae (Oreochromis mossambicus). Arch. Environ. Contam. Toxicol.45(3): 357-363.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	2661	NA	NR	ug/L	LAB	1998. James, R., K. Sampath, and P. Selvamani. Effect of EDTA on Reduction of Copper Toxicity in Oreochromis mossambicus (Peters). Bull. Environ. Contam. Toxicol.60: 487-493.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Wu, S.M., Y.C. Ho, and M.J. Shih. Effects of Ca2+ or Na+ on Metallothionein Expression in Tilapia Larvae (Oreochromis mossambicus) Exposed to Cadmium or Copper. Arch. Environ. Contam. Toxicol.52(2): 229-234.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	60	NA	NR	ug/L	LAB	1989. Welch, T.J., J.R.,Jr. Stauffer, and R.P. Morgan II. Temperature Preference as an Indicator of the Chronic Toxicity of Cupric Ions to Mozambique tilapia. Bull. Environ. Contam. Toxicol.43(5): 761-768.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	400		NC	ug/L	LAB	2003. Wu, S.M., K.J. Jong, and S.Y. Kuo. Effects of Copper Sulfate on Ion Balance and Growth in Tilapia Larvae (Oreochromis mossambicus). Arch. Environ. Contam. Toxicol.45(3): 357-363.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3000		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	30000	NR	NR	ug/L	LAB	1998. Jafri, S.I.H., and S.A. Shaikh. Toxicity of Copper to Tilapia, Oreochromis mossambicus (Teleostei): Histopathology of Liver and Testis. Pak. J. Zool.30(3): 167-171.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Wu, S.M., Y.C. Ho, and M.J. Shih. Effects of Ca2+ or Na+ on Metallothionein Expression in Tilapia Larvae (Oreochromis mossambicus) Exposed to Cadmium or Copper. Arch. Environ. Contam. Toxicol.52(2): 229-234.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	200		NR	ug/L	LAB	2003. Wu, S.M., K.J. Jong, and S.Y. Kuo. Effects of Copper Sulfate on Ion Balance and Growth in Tilapia Larvae (Oreochromis mossambicus). Arch. Environ. Contam. Toxicol.45(3): 357-363.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	20000	NR	NR	ug/L	LAB	1998. De Vera, M.P., and G.N. Pocsidio. Potential Protective Effect of Calcium Carbonate as Liming Agent Against Copper Toxicity in the African Tilapia Oreochromis mossambicus. Sci. Total Environ.214(1-3): 193-202.
Copper	Mozambique Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Pelgrom, S.M.G.J., L.P.M. Lamers, A. Haaijman, P.H.M. Balm, R.A.C. Lock, and S.E. Wendelaar Bonga. Interactions Between Copper and Cadmium During Single or Combined Metal Exposures in the Teleost Fish Oreochromis mossambicus: Heavy Metal Accumulation and Endocrine Events. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 6, Fishing News Books, London: 62-74.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1678	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.
Copper chloride (CuCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2184	NR	NR	ug/L	LAB	1996. Nussey, G., J.H.J. Van Vuren, and H.H. Du Preez. Acute Toxicity Tests of Copper on Juvenile Mozambique Tilapia, Oreochromis mossambicus (Cichlidae), at Different Temperatures. S. Afr. J. Wildl. Res.26(2): 47-55.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	600		NC	ug/L	LAB	1998. Sampath, K., R. James, and K.M.A. Ali. Effects of Copper and Zinc on Blood Parameters and Prediction of their Recovery in Oreochromis mossambicus (Pisces : Cichilidae). Indian J. Fish.45(2): 129-139.
Sulfuric acid copper(2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5000	NR	NR	ug/L	LAB	1998. Jafri, S.I.H., and S.A. Shaikh. Toxicity of Copper to Tilapia, Oreochromis mossambicus (Teleostei): Histopathology of Liver and Testis. Pak. J. Zool.30(3): 167-171.
Copper	Mullet	Fish	NR	Mortality	LC50	Not Reported	T	4750	NA	NR	ug/L	LAB	1993. Hou, L., H. Zhao, and Y. Wu. Acute Intoxication of Some Heavy Metals to Mugil So-Iuy and the Avoidance Reaction of Mugil So-Iuy. Oceanol. Limnol. Sin. (Haiyang Yu Huzhao)24(5): 507-510.
Copper	Mullet	Fish	NR	Mortality	LC50	Not Reported	T	4250	NA	NR	ug/L	LAB	1993. Hou, L., H. Zhao, and Y. Wu. Acute Intoxication of Some Heavy Metals to Mugil So-Iuy and the Avoidance Reaction of Mugil So-Iuy. Oceanol. Limnol. Sin. (Haiyang Yu Huzhao)24(5): 507-510.
Sulfuric acid copper(2+) salt (1:1)	Mummichog	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2007. Grosell, M., J. Blanchard, K.V. Brix, and R. Gerdes. Physiology is Pivotal for Interactions Between Salinity and Acute Copper Toxicity to Fish and Invertebrates. Aquat. Toxicol.84(2): 162-172.
Sulfuric acid copper(2+) salt (1:1)	Mummichog	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	2007. Grosell, M., J. Blanchard, K.V. Brix, and R. Gerdes. Physiology is Pivotal for Interactions Between Salinity and Acute Copper Toxicity to Fish and Invertebrates. Aquat. Toxicol.84(2): 162-172.
Copper	Mummichog	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2006. Blanchard, J., and M. Grosell. Copper Toxicity Across Salinities from Freshwater to Seawater in the Euryhaline Fish Fundulus heteroclitus: Is Copper an Ionoregulatory Toxicant in High Salinities?. Aquat. Toxicol.80(2): 131-139.
Copper	Mummichog	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	146.35	NR	NR	ug/L	LAB	2006. Blanchard, J., and M. Grosell. Copper Toxicity Across Salinities from Freshwater to Seawater in the Euryhaline Fish Fundulus heteroclitus: Is Copper an Ionoregulatory Toxicant in High Salinities?. Aquat. Toxicol.80(2): 131-139.
Sulfuric acid copper(2+) salt (1:1)	Mummichog	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000*	NA	NR	ug/L	LAB	1915. Thomas, A.. Effects of Certain Metallic Salts upon Fishes. Trans. Am. Fish. Soc.44: 120-124.
Copper	Nile Tilapia	Fish	Fresh	Growth	LOEC	Not Reported	T	1.2	NR	NR	ug/L	LAB	2007. Abdel-Tawwab, M., M.A.A. Mousa, M.H. Ahmad, and S.F.M. Sakr. The Use of Calcium Pre-Exposure as a Protective Agent Against Environmental Copper Toxicity for Juvenile Nile tilapia, Oreochromis niloticus (L.). Aquaculture264(1-4): 236-246.
Copper	Nile Tilapia	Fish	Fresh	Growth	LOEC	Whole Organism	T	100	NR	NR	ug/L	LAB	2007. Karaytug, S., C. Erdem, B. Cicik, and O. Ay. Effects of Copper on Hepatosomatic Index, Gonadosomatic Index and Condition Factor of Oreochromis niloticus (L. 1758). Fresenius Environ. Bull.16(11a): 1355-1358.
Copper	Nile Tilapia	Fish	Fresh	Growth	LOEC	Whole Organism	T	0.8	NR	NR	ug/L	LAB	2007. Abdel-Tawwab, M., M.A.A. Mousa, M.H. Ahmad, and S.F.M. Sakr. The Use of Calcium Pre-Exposure as a Protective Agent Against Environmental Copper Toxicity for Juvenile Nile tilapia, Oreochromis niloticus (L.). Aquaculture264(1-4): 236-246.
Copper	Nile Tilapia	Fish	Fresh	Growth	LOEC	Whole Organism	T	0.8	NR	NR	ug/L	LAB	2007. Abdel-Tawwab, M., M.A.A. Mousa, M.H. Ahmad, and S.F.M. Sakr. The Use of Calcium Pre-Exposure as a Protective Agent Against Environmental Copper Toxicity for Juvenile Nile tilapia, Oreochromis niloticus (L.). Aquaculture264(1-4): 236-246.
Copper	Nile Tilapia	Fish	Fresh	Growth	LOEC	Whole Organism	T	0.8	NR	NR	ug/L	LAB	2007. Abdel-Tawwab, M., M.A.A. Mousa, M.H. Ahmad, and S.F.M. Sakr. The Use of Calcium Pre-Exposure as a Protective Agent Against Environmental Copper Toxicity for Juvenile Nile tilapia, Oreochromis niloticus (L.). Aquaculture264(1-4): 236-246.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Growth	LOEL	Not Reported	T	150	NR	NR	ug/L	LAB	2003. Ali, A., S.M. Al-Ogaily, N.A. Al-Asgah, and J. Gropp. Effect of Sublethal Concentrations of Copper on the Growth Performance of Oreochromis niloticus. J. Appl. Ichthyol.19(4): 183-188.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Growth	LOEL	Whole Organism	T	1968000	NR	NR	ug/L	LAB	2006. Shaw, B.J., and R.D. Handy. Dietary Copper Exposure and Recovery in Nile Tilapia, Oreochromis niloticus. Aquat. Toxicol.76(2): 111-121.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Growth	LOEL	Whole Organism	T	1968000	NR	NR	ug/L	LAB	2006. Shaw, B.J., and R.D. Handy. Dietary Copper Exposure and Recovery in Nile Tilapia, Oreochromis niloticus. Aquat. Toxicol.76(2): 111-121.
Copper	Nile Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	0.8	NR	NR	ug/L	LAB	2007. Abdel-Tawwab, M., M.A.A. Mousa, M.H. Ahmad, and S.F.M. Sakr. The Use of Calcium Pre-Exposure as a Protective Agent Against Environmental Copper Toxicity for Juvenile Nile tilapia, Oreochromis niloticus (L.). Aquaculture264(1-4): 236-246.
Copper	Nile Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	100	NR	NR	ug/L	LAB	2007. Karaytug, S., C. Erdem, B. Cicik, and O. Ay. Effects of Copper on Hepatosomatic Index, Gonadosomatic Index and Condition Factor of Oreochromis niloticus (L. 1758). Fresenius Environ. Bull.16(11a): 1355-1358.
Copper	Nile Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	100	NR	NR	ug/L	LAB	2007. Karaytug, S., C. Erdem, B. Cicik, and O. Ay. Effects of Copper on Hepatosomatic Index, Gonadosomatic Index and Condition Factor of Oreochromis niloticus (L. 1758). Fresenius Environ. Bull.16(11a): 1355-1358.
Copper chloride (CuCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.
Copper chloride (CuCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	uM	LAB	2008. Atli, G., and M. Canli. Responses of Metallothionein and Reduced Glutathione in a Freshwater Fish Oreochromis niloticus Following Metal Exposures. Environ. Toxicol. Pharmacol.25(1): 33-38.
Copper chloride (CuCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	uM	LAB	2008. Atli, G., and M. Canli. Responses of Metallothionein and Reduced Glutathione in a Freshwater Fish Oreochromis niloticus Following Metal Exposures. Environ. Toxicol. Pharmacol.25(1): 33-38.
Copper chloride (CuCl)	Nile Tilapia	Fish	Fresh	Growth	NOEL	Whole Organism	T	20		NC	uM	LAB	2007. Atli, G., and M. Canli. Enzymatic Responses to Metal Exposures in a Freshwater Fish Oreochromis niloticus. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.145(2): 282-287.
Copper chloride (CuCl)	Nile Tilapia	Fish	Fresh	Growth	NOEL	Whole Organism	T	20		NC	uM	LAB	2007. Atli, G., and M. Canli. Enzymatic Responses to Metal Exposures in a Freshwater Fish Oreochromis niloticus. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.145(2): 282-287.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Growth	NOEL	Not Reported	T	1E+08		NC	ug/L	LAB	2004. Chen, C.Y., G.A. Wooster, and P.R. Bowser. Comparative Blood Chemistry and Histopathology of Tilapia Infected with Vibrio vulnificus or Streptococcus iniae or Exposed to Carbon Tetrachloride, Gentamicin, or Copper Sulfate. Aquaculture239(1-4): 421-443.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Growth	NOEL	Whole Organism	T	1000	NR	NR	ug/L	LAB	2005. Eroglu, K., G. Atli, and M. Canli. Effects of Metal (Cd, Cu, Zn) Interactions on the Profiles of Metallothionein-Like Proteins in the Nile Fish Oreochromis niloticus. Bull. Environ. Contam. Toxicol.75(2): 390-399.
Copper	Nile Tilapia	Fish	Fresh	Growth	NR	M-UNKNOWN SITE	T	NR	NR	NR	ug/L	LAB	2007. Abdel-Tawwab, M., M.A.A. Mousa, M.H. Ahmad, and S.F.M. Sakr. The Use of Calcium Pre-Exposure as a Protective Agent Against Environmental Copper Toxicity for Juvenile Nile tilapia, Oreochromis niloticus (L.). Aquaculture264(1-4): 236-246.
Copper	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	73400	NA	NR	ug/L	LAB	1982. Somsiri, C.. Acute Toxicity of Mercury, Copper and Zinc to the Nile tilapia. Thai Fish. Gaz.35(3): 313-318.
Copper	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	600	NR	NR	ug/L	LAB	1998. Oronsaye, J.A.O., and E.O. Ogunbor. Toxicity of Copper to Oreochromis niloticus Fingerlings in Ikpoba River Water. Indian J. Anim. Sci.68(9): 1001-1003.
Copper	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	63920	NA	NR	ug/L	LAB	1982. Somsiri, C.. Acute Toxicity of Mercury, Copper and Zinc to the Nile tilapia. Thai Fish. Gaz.35(3): 313-318.
Copper	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	58300	NA	NR	ug/L	LAB	1982. Somsiri, C.. Acute Toxicity of Mercury, Copper and Zinc to the Nile tilapia. Thai Fish. Gaz.35(3): 313-318.
Copper	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	1998. Oronsaye, J.A.O., and E.O. Ogunbor. Toxicity of Copper to Oreochromis niloticus Fingerlings in Ikpoba River Water. Indian J. Anim. Sci.68(9): 1001-1003.
Copper	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	680	NR	NR	ug/L	LAB	1998. Oronsaye, J.A.O., and E.O. Ogunbor. Toxicity of Copper to Oreochromis niloticus Fingerlings in Ikpoba River Water. Indian J. Anim. Sci.68(9): 1001-1003.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1207	NR	NR	ug/L	LAB	2008. Monteiro, S.M., E. Rocha, A. Fontainhas-Fernandes, and M. Sousa. Quantitative Histopathology of Oreochromis niloticus Gills After Copper Exposure. J. Fish Biol.73(6): 1376-1392.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	D	1059.25	NR	NR	ug/L	LAB	1987. Al-Akel, A.S.. Behavioural and the Physiological Changes in Oreochromis niloticus Due to Contamination of Copper. Z. Angew. Zool.74(4): 479-487.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1207	NR	NR	ug/L	LAB	2009. Monteiro, S.M., N.M.S. Dos Santos, M. Calejo, A. Fontainhas-Fernandes, and M. Sousa. Copper Toxicity in Gills of the Teleost Fish, Oreochromis niloticus: Effects in Apoptosis Induction and Cell Proliferation. Aquat. Toxicol.94(3): 219-228.
Copper	Nile Tilapia	Fish	Fresh	Mortality	LOEC	Not Reported	T	0.8	NR	NR	ug/L	LAB	2007. Abdel-Tawwab, M., M.A.A. Mousa, M.H. Ahmad, and S.F.M. Sakr. The Use of Calcium Pre-Exposure as a Protective Agent Against Environmental Copper Toxicity for Juvenile Nile tilapia, Oreochromis niloticus (L.). Aquaculture264(1-4): 236-246.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	420	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	420	NR	NR	ug/L	LAB	2005. Mostafa, B.B., F.A. El-Deeb, N.M. Ismail, and K.M. El-Said. Impact of Certain Plants and Synthetic Molluscicides on Some Fresh Water Snails and Fish. J. Egypt. Soc. Parasitol.35(3): 989-1007.
Copper	Nile Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	750	NR	NR	ug/L	LAB	1998. Oronsaye, J.A.O., and E.O. Ogunbor. Toxicity of Copper to Oreochromis niloticus Fingerlings in Ikpoba River Water. Indian J. Anim. Sci.68(9): 1001-1003.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500		NC	ug/L	LAB	2004. Cogun, H.Y., and F. Karglı. Effects of pH on the Mortality and Accumulation of Copper in Tissues of Oreochromis niloticus. Chemosphere55(2): 277-282.
Copper	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	2007. Karaytug, S., C. Erdem, B. Cicik, and O. Ay. Effects of Copper on Hepatosomatic Index, Gonadosomatic Index and Condition Factor of Oreochromis niloticus (L. 1758). Fresenius Environ. Bull.16(11a): 1355-1358.
Copper chloride (CuCl2)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2008. Oner, M., G. Atli, and M. Canli. Changes in Serum Biochemical Parameters of Freshwater Fish Oreochromis niloticus Following Prolonged Metal (Ag, Cd, Cr, Cu, Zn) Exposures. Environ. Toxicol. Chem.27(2): 360-366.
Copper chloride (CuCl2)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5000		NC	ug/L	LAB	2004. Cogun, H.Y., and F. Karglı. Effects of pH on the Mortality and Accumulation of Copper in Tissues of Oreochromis niloticus. Chemosphere55(2): 277-282.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	400	NR	NR	ug/L	LAB	2008. Monteiro, S.M., E. Rocha, A. Fontainhas-Fernandes, and M. Sousa. Quantitative Histopathology of Oreochromis niloticus Gills After Copper Exposure. J. Fish Biol.73(6): 1376-1392.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	395.8	NR	NR	ug/L	LAB	2009. Monteiro, S.M., E. Rocha, J.M. Mancera, A. Fontainhas-Fernandes, and M. Sousa. A Stereological Study of Copper Toxicity in Gills of Oreochromis niloticus. Ecotoxicol. Environ. Saf.72(1): 213-223.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	400	NR	NR	ug/L	LAB	2009. Monteiro, S.M., N.M.S. Dos Santos, M. Calejo, A. Fontainhas-Fernandes, and M. Sousa. Copper Toxicity in Gills of the Teleost Fish, Oreochromis niloticus: Effects in Apoptosis Induction and Cell Proliferation. Aquat. Toxicol.94(3): 219-228.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	400	NR	NR	ug/L	LAB	2005. Monteiro, S.M., J.M. Mancera, A. Fontainhas-Fernandes, and M. Sousa. Copper Induced Alterations of Biochemical Parameters in the Gill and Plasma of Oreochromis niloticus. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.141(4): 375-383.
Sulfuric acid copper(2+) salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1968000	NR	NR	ug/L	LAB	2006. Shaw, B.J., and R.D. Handy. Dietary Copper Exposure and Recovery in Nile Tilapia, Oreochromis niloticus. Aquat. Toxicol.76(2): 111-121.
Sulfuric acid copper(2+) salt (1:1)	Northern Pike	Fish	NR	Growth	NR	Whole Organism	T	34.9	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Northern Pike	Fish	NR	Growth	NR	Whole Organism	T	104.4	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Copper chloride (CuCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Copper chloride (CuCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	23	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Copper chloride (CuCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	11	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Copper chloride (CuCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	11	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Sulfuric acid copper(2+) salt (1:1)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1607		NR	ug/L	LAB	1982. Beleau, M.H., and J.A. Bartosz. Colorado River Fisheries Project Acute Toxicity of Selected Chemicals: Data Base. In: Rep.No.6,Dep.of Fish.Resour.,Univ.of Idaho,Moscow,ID: 243-254.
Sulfuric acid copper(2+) salt (1:1)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	176		NR	ug/L	LAB	1982. Beleau, M.H., and J.A. Bartosz. Colorado River Fisheries Project Acute Toxicity of Selected Chemicals: Data Base. In: Rep.No.6,Dep.of Fish.Resour.,Univ.of Idaho,Moscow,ID: 243-254.
Sulfuric acid copper(2+) salt (1:1)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	331		NR	ug/L	LAB	1982. Beleau, M.H., and J.A. Bartosz. Colorado River Fisheries Project Acute Toxicity of Selected Chemicals: Data Base. In: Rep.No.6,Dep.of Fish.Resour.,Univ.of Idaho,Moscow,ID: 243-254.
Sulfuric acid copper(2+) salt (1:1)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	354		NR	ug/L	LAB	1982. Beleau, M.H., and J.A. Bartosz. Colorado River Fisheries Project Acute Toxicity of Selected Chemicals: Data Base. In: Rep.No.6,Dep.of Fish.Resour.,Univ.of Idaho,Moscow,ID: 243-254.
Sulfuric acid copper(2+) salt (1:1)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	371		NR	ug/L	LAB	1982. Beleau, M.H., and J.A. Bartosz. Colorado River Fisheries Project Acute Toxicity of Selected Chemicals: Data Base. In: Rep.No.6,Dep.of Fish.Resour.,Univ.of Idaho,Moscow,ID: 243-254.
Sulfuric acid copper(2+) salt (1:1)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	411		NR	ug/L	LAB	1982. Beleau, M.H., and J.A. Bartosz. Colorado River Fisheries Project Acute Toxicity of Selected Chemicals: Data Base. In: Rep.No.6,Dep.of Fish.Resour.,Univ.of Idaho,Moscow,ID: 243-254.
Sulfuric acid copper(2+) salt (1:1)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	495		NR	ug/L	LAB	1982. Beleau, M.H., and J.A. Bartosz. Colorado River Fisheries Project Acute Toxicity of Selected Chemicals: Data Base. In: Rep.No.6,Dep.of Fish.Resour.,Univ.of Idaho,Moscow,ID: 243-254.
Copper chloride (CuCl2)	Northern Squawfish	Fish	Fresh	Mortality	NR	Not Reported	T	5000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Nitric acid, Copper(2+) salt	Northern Squawfish	Fish	Fresh	Mortality	NR	Not Reported	T	3000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Sulfuric acid copper(2+) salt (1:1)	Northern Squawfish	Fish	Fresh	Mortality	NR	Not Reported	T	4000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Sulfuric acid copper(2+) salt (1:1)	Northern Squawfish	Fish	Fresh	Mortality	NR	Not Reported	T	5000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	1018	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	1092	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	1136	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	417	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	528	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	858	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	291	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	313	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	379	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	205	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	234	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.
Sulfuric acid copper(2+) salt (1:1)	Onesided Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	248	NR	NR	ug/L	LAB	2004. Villar, C.A., S.E. Gomez, and C.A. Bentos. Acute Cu Toxicity, Metal Bioaccumulation and Ion Loss in the Neotropical Cyprinodontiform Jenynsia multidentata. Rev. Mus. Argent. Cienc. Nat. Nueva Ser.6(1): 191-195.
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	D	1300	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	8300	D	1400	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	930	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	9900	D	1900	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	9900	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	17000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	6100	D	940	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	8300	D	980	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	9000	D	760	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	930	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	9900	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	5400	D	720	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	5800	D	700	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	710	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	7100	D	610	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Orangethroat Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	9400	D	590	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Pacu	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Garcia Sampaio, F., C. De lima Boijink, E. Tie Oba, L. Romagueira Bichara Dos Santos, A. Lucia Kalinin, and F. Tadeu Ran. Antioxidant Defenses and Biochemical Changes in Pacu (Piaractus mesopotamicus) in Response to Single and Combined Copper and Hypoxia Exposure. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.147(1): 43-51.
Sulfuric acid copper(2+) salt (1:1)	Pacu	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Garcia Sampaio, F., C. De lima Boijink, E. Tie Oba, L. Romagueira Bichara Dos Santos, A. Lucia Kalinin, and F. Tadeu Ran. Antioxidant Defenses and Biochemical Changes in Pacu (Piaractus mesopotamicus) in Response to Single and Combined Copper and Hypoxia Exposure. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.147(1): 43-51.
Copper	Pearl Cichlid	Fish	NR	Mortality	LC50	Not Reported	T	304	NA	NR	ug/L	NR	1983. Toledo, A.P.P., and M.L. Delavechia. Cupric Ion Tolerance in the Fish Geophagus brasiliensis. I. Chronic Toxicity. C. A. Sel. -Environ. Pollut.25: 4.
Sulfuric acid copper(2+) salt (1:1)	Pearl Dace	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Tsai, C.F.. Survival, Overturning and Lethal Exposure Times for the Pearl Dace, Semotilus margaritus (Cope), Exposed to Copper Solution. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.64(1): 1-6.
Copper	Pearlspot	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	1997. Veena, K.B., C.K. Radhakrishnan, and J. Chacko. Heavy Metal Induced Biochemical Effects in an Estuarine Teleost. Indian J. Mar. Sci.26(1): 74-78.
Nitric acid, Copper(2+) salt	Pearlspot	Fish	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1989. Gaikwad, S.A.. Effects of Mixture and Three Individual Heavy Metals on Susceptibility of Three Fresh Water Fishes. Pollut. Res.8(1): 33-35.
Sulfuric acid copper(2+) salt (1:1)	Pearlspot	Fish	Fresh	Mortality	LC50	Not Reported	T	732*	NA	NR	ug/L	LAB	1989. Gaikwad, S.A.. Acute Toxicity of Mercury, Copper and Selenium to the Fish Etroplus maculatus. Environ. Ecol.7(3): 694-696.
Sulfuric acid copper(2+) salt (1:1)	Pejerrey	Fish	Fresh	Growth	LOEC	Not Reported	T	106	NR	NR	ug/L	LAB	2008. Carriquiriborde, P., and A.E. Ronco. Distinctive Accumulation Patterns of Cd(II), Cu(II), and Cr(VI) in Tissue of the South American Teleost, Pejerrey (Odontesthes bonariensis). Aquat. Toxicol.86(2): 313-322.
Sulfuric acid copper(2+) salt (1:1)	Pejerrey	Fish	Fresh	Growth	LOEC	Whole Organism	T	106	NR	NR	ug/L	LAB	2008. Carriquiriborde, P., and A.E. Ronco. Distinctive Accumulation Patterns of Cd(II), Cu(II), and Cr(VI) in Tissue of the South American Teleost, Pejerrey (Odontesthes bonariensis). Aquat. Toxicol.86(2): 313-322.
Sulfuric acid copper(2+) salt (1:1)	Pejerrey	Fish	Fresh	Growth	NOEC	Not Reported	T	58.5	NR	NR	ug/L	LAB	2008. Carriquiriborde, P., and A.E. Ronco. Distinctive Accumulation Patterns of Cd(II), Cu(II), and Cr(VI) in Tissue of the South American Teleost, Pejerrey (Odontesthes bonariensis). Aquat. Toxicol.86(2): 313-322.
Sulfuric acid copper(2+) salt (1:1)	Pejerrey	Fish	Fresh	Growth	NOEC	Whole Organism	T	58.5	NR	NR	ug/L	LAB	2008. Carriquiriborde, P., and A.E. Ronco. Distinctive Accumulation Patterns of Cd(II), Cu(II), and Cr(VI) in Tissue of the South American Teleost, Pejerrey (Odontesthes bonariensis). Aquat. Toxicol.86(2): 313-322.
Sulfuric acid copper(2+) salt (1:1)	Pejerrey	Fish	Fresh	Mortality	LC50	Not Reported	T	383		NC	ug/L	LAB	2002. Carriquiriborde, P., and A. Ronco. Sensitivity of the Neotropical Teleost Odonthestes bonariensis (Pisces, Atherinidae) to Chromium(VI), Copper(II), and Cadmium(II). Bull. Environ. Contam. Toxicol.69(2): 294-301.
Sulfuric acid copper(2+) salt (1:1)	Pejerrey	Fish	Fresh	Mortality	LC50	Not Reported	T	90		NC	ug/L	LAB	2002. Carriquiriborde, P., and A. Ronco. Sensitivity of the Neotropical Teleost Odonthestes bonariensis (Pisces, Atherinidae) to Chromium(VI), Copper(II), and Cadmium(II). Bull. Environ. Contam. Toxicol.69(2): 294-301.
Sulfuric acid copper(2+) salt (1:1)	Pejerrey	Fish	Fresh	Mortality	LC50	Not Reported	T	218		NC	ug/L	LAB	2002. Carriquiriborde, P., and A. Ronco. Sensitivity of the Neotropical Teleost Odonthestes bonariensis (Pisces, Atherinidae) to Chromium(VI), Copper(II), and Cadmium(II). Bull. Environ. Contam. Toxicol.69(2): 294-301.
Sulfuric acid copper(2+) salt (1:1)	Pejerrey	Fish	Fresh	Mortality	LC50	Not Reported	T	80		NC	ug/L	LAB	2002. Carriquiriborde, P., and A. Ronco. Sensitivity of the Neotropical Teleost Odonthestes bonariensis (Pisces, Atherinidae) to Chromium(VI), Copper(II), and Cadmium(II). Bull. Environ. Contam. Toxicol.69(2): 294-301.
Sulfuric acid copper(2+) salt (1:1)	Pejerrey	Fish	Fresh	Mortality	NR	Not Reported	T	106	NR	NR	ug/L	LAB	2008. Carriquiriborde, P., and A.E. Ronco. Distinctive Accumulation Patterns of Cd(II), Cu(II), and Cr(VI) in Tissue of the South American Teleost, Pejerrey (Odontesthes bonariensis). Aquat. Toxicol.86(2): 313-322.
Sulfuric acid copper(2+) salt (1:1)	Pejerrey	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	58.5	NR	NR	ug/L	LAB	2008. Carriquiriborde, P., and A.E. Ronco. Distinctive Accumulation Patterns of Cd(II), Cu(II), and Cr(VI) in Tissue of the South American Teleost, Pejerrey (Odontesthes bonariensis). Aquat. Toxicol.86(2): 313-322.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Peppered Corydoras	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10	NR	NR	ug/L	LAB	2005. Cavas, T., N.N. Garanko, and V.V. Arkhipchuk. Induction of Micronuclei and Binuclei in Blood, Gill and Liver Cells of Fishes Subchronically Exposed to Cadmium Chloride and Copper Sulphate. Food Chem. Toxicol.43(4): 569-574.
Copper chloride (CuCl2)	Perch	Fish	Fresh	Growth	NR		T	39	NA	NR	ug/L	LAB	1985. Collvin, L.. The Effect of Copper on Growth, Food Consumption and Food Conversion of Perch Perca fluviatilis L. Offered Maximal Food Rations. Aquat. Toxicol.6(2): 105-113.
Copper chloride (CuCl2)	Perch	Fish	Fresh	Growth	NR		T	22	NA	NR	ug/L	LAB	1985. Collvin, L.. The Effect of Copper on Growth, Food Consumption and Food Conversion of Perch Perca fluviatilis L. Offered Maximal Food Rations. Aquat. Toxicol.6(2): 105-113.
Copper chloride (CuCl2)	Perch	Fish	Fresh	Growth	NR		T	44	NA	NR	ug/L	LAB	1985. Collvin, L.. Effects of Copper on Growth and Starvation in Perch, Perca fluviatilis L.. J. Fish Biol.27(6): 757-764.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Growth	NR		T	87	NA	NR	ug/L	LAB	1984. Collvin, L.. The Effects of Copper on Maximum Respiration Rate and Growth Rate of Perch, Perca fluviatilis L.. Water Res.18(2): 139-144.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	1280	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	760	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	710	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1984. Collvin, L.. The Effects of Copper on Maximum Respiration Rate and Growth Rate of Perch, Perca fluviatilis L.. Water Res.18(2): 139-144.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	620	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Mortality	NR	Not Reported	T	130*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4100*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2100*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	260*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	510*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Reproduction	NR		T	4100*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Perch	Fish	Fresh	Reproduction	NR		T	8200*	NA	NR	ug/L	LAB	1941. Stroganov, N.S., and A.T. Pozhitkov. Experimental Study to Establish the Physiological Boundaries for the Toxic Effect of Copper and Ammonia Ions on Fish and Certain Invertebrates. Uch.Zap.Mosk.Gos.Univ.No.60 (Trudy Lab.Gidrobiol., Book 4): 25-88.
Sulfuric acid copper(2+) salt (1:1)	Pink Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	143	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid copper(2+) salt (1:1)	Pink Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	199	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid copper(2+) salt (1:1)	Pink Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	87	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	LC50	Not Reported	T	29	NR	NR	ug/L	LAB	1999. Mazon, A.F., and M.N. Fernandes. Toxicity and Differential Tissue Accumulation of Copper in the Tropical Freshwater Fish, Prochilodus scrofa (Prochilodontidae). Bull. Environ. Contam. Toxicol.63(6): 797-804.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	LC50	Not Reported	T	14	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	LC50	Not Reported	T	16	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	LC50	Not Reported	T	88	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	LC50	Not Reported	T	98	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	LC50	Not Reported	T	15		NR	ug/L	LAB	2004. Takasusuki, J., M.R.R. Araujo, and M.N. Fernandes. Effect of Water pH on Copper Toxicity in the Neotropical Fish, Prochilodus scrofa (Prochilodondidae). Bull. Environ. Contam. Toxicol.72(5): 1075-1082.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	LC50	Not Reported	T	200		NR	ug/L	LAB	2004. Takasusuki, J., M.R.R. Araujo, and M.N. Fernandes. Effect of Water pH on Copper Toxicity in the Neotropical Fish, Prochilodus scrofa (Prochilodondidae). Bull. Environ. Contam. Toxicol.72(5): 1075-1082.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR	Not Reported	T	29	NR	NR	ug/L	LAB	2002. Cerqueira, C.C.C., and M.N. Fernandes. Gill Tissue Recovery After Copper Exposure and Blood Parameter Responses in the Tropical Fish Prochilodus scrofa. Ecotoxicol. Environ. Saf.52(2): 83-91.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NR	ug/L	LAB	2002. Mazon, A.F., C.C.C. Cerqueira, and M.N. Fernandes. Gill Cellular Changes Induced by Copper Exposure in the South American Tropical Freshwater Fish Prochilodus scrofa. Environ. Res.88(1): 52-63.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	51	NR	NR	ug/L	LAB	1999. Mazon, A.F., and M.N. Fernandes. Toxicity and Differential Tissue Accumulation of Copper in the Tropical Freshwater Fish, Prochilodus scrofa (Prochilodontidae). Bull. Environ. Contam. Toxicol.63(6): 797-804.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	25	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	120	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	130	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	16	NR	NR	ug/L	LAB	1999. Mazon, A.F., and M.N. Fernandes. Toxicity and Differential Tissue Accumulation of Copper in the Tropical Freshwater Fish, Prochilodus scrofa (Prochilodontidae). Bull. Environ. Contam. Toxicol.63(6): 797-804.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	10	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	10	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	70	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.
Sulfuric acid copper(2+) salt (1:1)	Piranaha	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	73	NR	NR	ug/L	LAB	2006. Carvalho, C.S., and M.N. Fernandes. Effect of Temperature on Copper Toxicity and Hematological Responses in the Neotropical Fish Prochilodus scrofa at Low and High pH. Aquaculture251(1): 109-117.
Copper	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	3500	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	2700	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1240	NR	NR	ug/L	LAB	1977. Spear, P.. Copper Accumulation Kinetics and Lethal Tolerance in Relation to Fish Size. M.S.Thesis, Concordia Univ., Montreal, Canada: 69 p..
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1240	NR	NR	ug/L	LAB	1977. Spear, P.. Copper Accumulation Kinetics and Lethal Tolerance in Relation to Fish Size. M.S.Thesis, Concordia Univ., Montreal, Canada: 69 p..
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NR	NR	ug/L	LAB	1977. Spear, P.. Copper Accumulation Kinetics and Lethal Tolerance in Relation to Fish Size. M.S.Thesis, Concordia Univ., Montreal, Canada: 69 p..
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1660	NR	NR	ug/L	LAB	1977. Spear, P.. Copper Accumulation Kinetics and Lethal Tolerance in Relation to Fish Size. M.S.Thesis, Concordia Univ., Montreal, Canada: 69 p..
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1670	NR	NR	ug/L	LAB	1977. Spear, P.. Copper Accumulation Kinetics and Lethal Tolerance in Relation to Fish Size. M.S.Thesis, Concordia Univ., Montreal, Canada: 69 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1740	NR	NR	ug/L	LAB	1977. Spear, P.. Copper Accumulation Kinetics and Lethal Tolerance in Relation to Fish Size. M.S.Thesis, Concordia Univ., Montreal, Canada: 69 p..
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1940	NR	NR	ug/L	LAB	1977. Spear, P.. Copper Accumulation Kinetics and Lethal Tolerance in Relation to Fish Size. M.S.Thesis, Concordia Univ., Montreal, Canada: 69 p..
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1240	NA	NR	ug/L	LAB	1980. Anderson, P.D., and P.A. Spear. Copper Pharmacokinetics in Fish Gills-II Body Size Relationships for Accumulation and Tolerance. Water Res.14(8): 1107-1111.
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1240	NA	NR	ug/L	LAB	1980. Anderson, P.D., and P.A. Spear. Copper Pharmacokinetics in Fish Gills-II Body Size Relationships for Accumulation and Tolerance. Water Res.14(8): 1107-1111.
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1980. Anderson, P.D., and P.A. Spear. Copper Pharmacokinetics in Fish Gills-II Body Size Relationships for Accumulation and Tolerance. Water Res.14(8): 1107-1111.
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1660	NA	NR	ug/L	LAB	1980. Anderson, P.D., and P.A. Spear. Copper Pharmacokinetics in Fish Gills-II Body Size Relationships for Accumulation and Tolerance. Water Res.14(8): 1107-1111.
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1670	NA	NR	ug/L	LAB	1980. Anderson, P.D., and P.A. Spear. Copper Pharmacokinetics in Fish Gills-II Body Size Relationships for Accumulation and Tolerance. Water Res.14(8): 1107-1111.
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1740	NA	NR	ug/L	LAB	1980. Anderson, P.D., and P.A. Spear. Copper Pharmacokinetics in Fish Gills-II Body Size Relationships for Accumulation and Tolerance. Water Res.14(8): 1107-1111.
Sulfuric acid copper(2+) salt (1:1)	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	1940	NA	NR	ug/L	LAB	1980. Anderson, P.D., and P.A. Spear. Copper Pharmacokinetics in Fish Gills-II Body Size Relationships for Accumulation and Tolerance. Water Res.14(8): 1107-1111.
Nitric acid, Copper(2+) salt	Pumpkinseed	Fish	Fresh	Mortality	LC50*	Not Reported	T	3800	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nitric acid, Copper(2+) salt	Pumpkinseed	Fish	Fresh	Mortality	LC50*	Not Reported	T	2900	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nitric acid, Copper(2+) salt	Pumpkinseed	Fish	Fresh	Mortality	LC50*	Not Reported	T	2400	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Sulfuric acid copper(2+) salt (1:1)	Purple Spotted Gudgeon	Fish	Fresh	Mortality	LOEC	Not Reported	T	64	NA	NR	ug/L	LAB	1992. Rippon, G.D., and R.V. Hyne. Purple Spotted Gudgeon: Its Use as a Standard Toxicity Test Animal in Tropical Northern Australia. Bull. Environ. Contam. Toxicol.49(3): 471-476.
Sulfuric acid copper(2+) salt (1:1)	Purple Spotted Gudgeon	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NA	NR	ug/L	LAB	1992. Rippon, G.D., and R.V. Hyne. Purple Spotted Gudgeon: Its Use as a Standard Toxicity Test Animal in Tropical Northern Australia. Bull. Environ. Contam. Toxicol.49(3): 471-476.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	D	980	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	14000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	18000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	D	840	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	5500	D	780	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	5900	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	D	660	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	2600	D	480	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	4500	D	670	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Darter	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	D	660	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	EC50	Not Reported	T	46	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	ER01	Not Reported	T	4600	NR	NR	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	ER10	Not Reported	T	6700	NR	NR	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	ER20	Not Reported	T	9000	NR	NR	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	ER50	Not Reported	T	15900	NR	NR	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	IC1	Not Reported	T	1.1		NR	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	IC10	Not Reported	T	10.8		NR	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	IC10	Not Reported	T	8.4	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	IC10	Not Reported	T	9.5	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	IC20	Not Reported	T	21.6		NR	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	IC50	Not Reported	T	54		NR	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Copper	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	12	NR	NR	ug/L	LAB	1995. Neville, C.. Interpretation of Data from Short-Term Growth Tests Using the Sacfry to Early Swim-Up Life Stage of Rainbow Trout. In: G.F.Westlake, J.L.Parrott and A.J.Niimi (Eds.), Proc.21st Annual Aquatic Toxicity Workshop, Oct.3-5, 1994, Sarnia, Ontario; Can.Tech.Rep.Fish.Aquat.Sci.No.2050: 52-54.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	35.7	D	34.4	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	14.5	D	15.8	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	59		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	22.4	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	28.5	NR	NR	ug/L	LAB	2006. Gagnon, A., C. Jumarie, and A. Hontela. Effects of Cu on Plasma Cortisol and Cortisol Secretion by Adrenocortical Cells of Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.78(1): 59-65.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	22	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	12	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	11.8	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	282000	NR	NR	ug/L	LAB	2002. Kamunde, C., M. Grosell, D. Higgs, and C.M. Wood. Copper Metabolism in Actively Growing Rainbow Trout (Oncorhynchus mykiss): Interactions Between Dietary and Waterborne Copper Uptake. J. Exp. Biol.205: 279-290.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	282000	NR	NR	ug/L	LAB	2002. Kamunde, C., M. Grosell, D. Higgs, and C.M. Wood. Copper Metabolism in Actively Growing Rainbow Trout (Oncorhynchus mykiss): Interactions Between Dietary and Waterborne Copper Uptake. J. Exp. Biol.205: 279-290.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	282000	NR	NR	ug/L	LAB	2002. Kamunde, C., M. Grosell, D. Higgs, and C.M. Wood. Copper Metabolism in Actively Growing Rainbow Trout (Oncorhynchus mykiss): Interactions Between Dietary and Waterborne Copper Uptake. J. Exp. Biol.205: 279-290.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	282000	NR	NR	ug/L	LAB	2002. Kamunde, C., M. Grosell, D. Higgs, and C.M. Wood. Copper Metabolism in Actively Growing Rainbow Trout (Oncorhynchus mykiss): Interactions Between Dietary and Waterborne Copper Uptake. J. Exp. Biol.205: 279-290.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	282000	NR	NR	ug/L	LAB	2002. Kamunde, C., M. Grosell, D. Higgs, and C.M. Wood. Copper Metabolism in Actively Growing Rainbow Trout (Oncorhynchus mykiss): Interactions Between Dietary and Waterborne Copper Uptake. J. Exp. Biol.205: 279-290.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	282000	NR	NR	ug/L	LAB	2002. Kamunde, C., M. Grosell, D. Higgs, and C.M. Wood. Copper Metabolism in Actively Growing Rainbow Trout (Oncorhynchus mykiss): Interactions Between Dietary and Waterborne Copper Uptake. J. Exp. Biol.205: 279-290.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	277.8	NR	NR	ug/L	LAB	2001. Kamunde, C.N., M. Grosell, J.N.A. Lott, and C.M. Wood. Copper Metabolism and Gut Morphology in Rainbow Trout (Oncorhynchus mykiss) During Chronic Sublethal Dietary Copper Exposure. Can. J. Fish. Aquat. Sci.58(2): 293-305.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	277800		NR	ug/L	LAB	2001. Kamunde, C.N., M. Grosell, J.N.A. Lott, and C.M. Wood. Copper Metabolism and Gut Morphology in Rainbow Trout (Oncorhynchus mykiss) During Chronic Sublethal Dietary Copper Exposure. Can. J. Fish. Aquat. Sci.58(2): 293-305.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	30	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	15	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEL	Not Reported	T	111		NC	nmol/L	LAB	2002. McGeer, J.C., C. Szebedinszky, D.G. McDonald, and C.M. Wood. The Role of Dissolved Organic Carbon in Moderating the Bioavailability and Toxicity of Cu to Rainbow Trout During Chronic Waterborne Exposure. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 147-160.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEL	Not Reported	T	108		NC	nmol/L	LAB	2002. McGeer, J.C., C. Szebedinszky, D.G. McDonald, and C.M. Wood. The Role of Dissolved Organic Carbon in Moderating the Bioavailability and Toxicity of Cu to Rainbow Trout During Chronic Waterborne Exposure. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 147-160.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEL	Not Reported	T	52.34		NC	ug/L	LAB	2005. Kamunde, C.N., S. Niyogi, and C.M. Wood. Interaction of Dietary Sodium Chloride and Waterborne Copper in Rainbow Trout (Oncorhynchus mykiss): Copper Toxicity and Sodium and Chloride Homeostasis. Can. J. Fish. Aquat. Sci.62(2): 390-399.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEL	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Vosyliene, M.Z., and L. Petrauskiene. The Effect of Long-Term Exposure to Copper on Physiological Parameters of Rainbow Trout (Oncorhynchus mykiss) 1. Studies of Morphological Parameters. Ekologija3: 23-26.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEL	Whole Organism	T	990000	NR	NR	ug/L	LAB	1988. Julshamn, K., K.J. Andersen, O. Ringdal, and J. Brenna. Effect of Dietary Copper on the Hepatic Concentration and Subcellular Distribution of Copper and Zinc in the Rainbow Trout (Salmo gairdneri). Aquaculture73: 143-155.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEL	Whole Organism	T	52.34	NR	NR	ug/L	LAB	2006. Niyogi, S., C.N. Kamunde, and C.M. Wood. Food Selection, Growth and Physiology in Relation to Dietary Sodium Chloride Content in Rainbow Trout (Oncorhynchus mykiss) Under Chronic Waterborne Cu Exposure. Aquat. Toxicol.77(2): 210-221.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	MATC	Not Reported	T	40		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	MATC	Not Reported	T	16	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	MATC	Not Reported	T	8.6	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	MATC	Whole Organism	T	20	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	MATC	Whole Organism	T	10	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Copper	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	45	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	22.2	D	21.7	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	9.47	D	9.21	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Copper oxide (CuO)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	292800	NR	NR	ug/L	LAB	2006. Kjoss, V.A., C.M. Wood, and D.G. McDonald. Effects of Different Ligands on the Bioaccumulation and Subsequent Depuration of Dietary Cu and Zn in Juvenile Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.63(2): 412-422.
Copper oxide (CuO)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	411900	NR	NR	ug/L	LAB	2006. Kjoss, V.A., C.M. Wood, and D.G. McDonald. Effects of Different Ligands on the Bioaccumulation and Subsequent Depuration of Dietary Cu and Zn in Juvenile Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.63(2): 412-422.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	27		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	11.8	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	1041.9	NR	NR	ug/L	LAB	2001. Kamunde, C.N., M. Grosell, J.N.A. Lott, and C.M. Wood. Copper Metabolism and Gut Morphology in Rainbow Trout (Oncorhynchus mykiss) During Chronic Sublethal Dietary Copper Exposure. Can. J. Fish. Aquat. Sci.58(2): 293-305.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	1041.9	NR	NR	ug/L	LAB	2001. Kamunde, C.N., M. Grosell, J.N.A. Lott, and C.M. Wood. Copper Metabolism and Gut Morphology in Rainbow Trout (Oncorhynchus mykiss) During Chronic Sublethal Dietary Copper Exposure. Can. J. Fish. Aquat. Sci.58(2): 293-305.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	12	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	6.2	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	11.8	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	6.2	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	282000	NR	NR	ug/L	LAB	2002. Kamunde, C., M. Grosell, D. Higgs, and C.M. Wood. Copper Metabolism in Actively Growing Rainbow Trout (Oncorhynchus mykiss): Interactions Between Dietary and Waterborne Copper Uptake. J. Exp. Biol.205: 279-290.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Neville, C.M.. Short-Term Early Life Stage Growth Test Using Sacfry and Early Swim-Up Stages of Rainbow Trout (Oncorhynchus mykiss). Ontario Ministry of the Environment & Energy, Toronto, Ontario: 27 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	1041.9	NR	NR	ug/L	LAB	2001. Kamunde, C.N., M. Grosell, J.N.A. Lott, and C.M. Wood. Copper Metabolism and Gut Morphology in Rainbow Trout (Oncorhynchus mykiss) During Chronic Sublethal Dietary Copper Exposure. Can. J. Fish. Aquat. Sci.58(2): 293-305.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	1041.9	NR	NR	ug/L	LAB	2001. Kamunde, C.N., M. Grosell, J.N.A. Lott, and C.M. Wood. Copper Metabolism and Gut Morphology in Rainbow Trout (Oncorhynchus mykiss) During Chronic Sublethal Dietary Copper Exposure. Can. J. Fish. Aquat. Sci.58(2): 293-305.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	323400	NR	NR	ug/L	LAB	2006. Kjoss, V.A., C.M. Wood, and D.G. McDonald. Effects of Different Ligands on the Bioaccumulation and Subsequent Depuration of Dietary Cu and Zn in Juvenile Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.63(2): 412-422.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	401400	NR	NR	ug/L	LAB	2006. Kjoss, V.A., C.M. Wood, and D.G. McDonald. Effects of Different Ligands on the Bioaccumulation and Subsequent Depuration of Dietary Cu and Zn in Juvenile Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.63(2): 412-422.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	41.06	NR	NR	ug/L	LAB	2008. Kamunde, C., and R. MacPhail. Bioaccumulation and Hepatic Speciation of Copper in Rainbow Trout (Oncorhynchus mykiss) During Chronic Waterborne Copper Exposure. Arch. Environ. Contam. Toxicol.54(3): 493-503.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	41.06	NR	NR	ug/L	LAB	2008. Kamunde, C., and R. MacPhail. Bioaccumulation and Hepatic Speciation of Copper in Rainbow Trout (Oncorhynchus mykiss) During Chronic Waterborne Copper Exposure. Arch. Environ. Contam. Toxicol.54(3): 493-503.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	41.06	NR	NR	ug/L	LAB	2008. Kamunde, C., and R. MacPhail. Bioaccumulation and Hepatic Speciation of Copper in Rainbow Trout (Oncorhynchus mykiss) During Chronic Waterborne Copper Exposure. Arch. Environ. Contam. Toxicol.54(3): 493-503.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	41.06	NR	NR	ug/L	LAB	2008. Kamunde, C., and R. MacPhail. Bioaccumulation and Hepatic Speciation of Copper in Rainbow Trout (Oncorhynchus mykiss) During Chronic Waterborne Copper Exposure. Arch. Environ. Contam. Toxicol.54(3): 493-503.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	726000		NR	ug/L	LAB	2002. Campbell, H.A., R.D. Handy, and D.W. Sims. Increased Metabolic Cost of Swimming and Consequent Alterations to Circadian Activity in Rainbow Trout (Oncorhynchus mykiss) Exposed to Dietary Copper. Can. J. Fish. Aquat. Sci.59(5): 768-777.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	15	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	8	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	59		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	111		NC	nmol/L	LAB	2002. McGeer, J.C., C. Szebedinszky, D.G. McDonald, and C.M. Wood. The Role of Dissolved Organic Carbon in Moderating the Bioavailability and Toxicity of Cu to Rainbow Trout During Chronic Waterborne Exposure. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 147-160.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	1.73		NC	ug/L	LAB	2000. Taylor, L.N., J.C. McGeer, C.M. Wood, and D.G. McDonald. Physiological Effects of Chronic Copper Exposure to Rainbow Trout (Oncorhynchus mykiss) in Hard and Soft Water: Evaluation of Chronic Indicators. Environ. Toxicol. Chem.19(9): 2298-2308.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	75.8		NC	ug/L	LAB	2000. McGeer, J.C., C. Szebedinszky, D.G. McDonald, and C.M. Wood. Effects of Chronic Sublethal Exposure to Waterborne Cu, Cd or Zn in Rainbow Trout 1: Iono-Regulatory Disturbance and Metabolic Costs. Aquat. Toxicol.50(3): 231-243.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	0.24		NR	umol/g	LAB	2003. Kamunde, C., and C.M. Wood. The Influence of Ration Size on Copper Homeostasis During Sublethal Dietary Copper Exposure in Juvenile Rainbow Trout, Oncorhynchus mykiss. Aquat. Toxicol.62(3): 235-254.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	0.24		NR	umol/g	LAB	2003. Kamunde, C., and C.M. Wood. The Influence of Ration Size on Copper Homeostasis During Sublethal Dietary Copper Exposure in Juvenile Rainbow Trout, Oncorhynchus mykiss. Aquat. Toxicol.62(3): 235-254.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	0.24		NR	umol/g	LAB	2003. Kamunde, C., and C.M. Wood. The Influence of Ration Size on Copper Homeostasis During Sublethal Dietary Copper Exposure in Juvenile Rainbow Trout, Oncorhynchus mykiss. Aquat. Toxicol.62(3): 235-254.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	62.6		NR	ug/L	LAB	2000. Taylor, L.N., J.C. McGeer, C.M. Wood, and D.G. McDonald. Physiological Effects of Chronic Copper Exposure to Rainbow Trout (Oncorhynchus mykiss) in Hard and Soft Water: Evaluation of Chronic Indicators. Environ. Toxicol. Chem.19(9): 2298-2308.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Whole Organism	T	721000	NR	NR	ug/L	LAB	2005. Campbell, H.A., R.D. Handy, and D.W. Sims. Shifts in a Fish's Resource Holding Power During a Contact Paired Interaction: The Influence of a Copper-Contaminated Diet in Rainbow Trout. Physiol. Biochem. Zool.78(5): 706-714.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	579100	NR	NR	ug/L	LAB	2005. Kjoss, V.A., M. Grosell, and C.M. Wood. The Influence of Dietary Na on Cu Accumulation in Juvenile Rainbow Trout Exposed to Combined Dietary and Waterborne Cu in Soft Water. Arch. Environ. Contam. Toxicol.49(4): 520-527.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	579100	NR	NR	ug/L	LAB	2005. Kjoss, V.A., M. Grosell, and C.M. Wood. The Influence of Dietary Na on Cu Accumulation in Juvenile Rainbow Trout Exposed to Combined Dietary and Waterborne Cu in Soft Water. Arch. Environ. Contam. Toxicol.49(4): 520-527.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	579100	NR	NR	ug/L	LAB	2005. Kjoss, V.A., M. Grosell, and C.M. Wood. The Influence of Dietary Na on Cu Accumulation in Juvenile Rainbow Trout Exposed to Combined Dietary and Waterborne Cu in Soft Water. Arch. Environ. Contam. Toxicol.49(4): 520-527.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Whole Organism	T	810000	NR	NR	ug/L	LAB	1988. Julshamn, K., K.J. Andersen, O. Ringdal, and J. Brenna. Effect of Dietary Copper on the Hepatic Concentration and Subcellular Distribution of Copper and Zinc in the Rainbow Trout (Salmo gairdneri). Aquaculture73: 143-155.
Copper	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Copper	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Copper	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	uM	LAB	1983. Leland, H.V.. Ultrastructural Changes in the Hepatocytes of Juvenile Rainbow Trout and Mature Brown Trout Exposed to Copper or Zinc. Environ. Toxicol. Chem.2(3): 353-368.
Copper	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1984. Roch, M., and J.A. McCarter. Hepatic Metallothionein Production and Resistance to Heavy Metals by Rainbow Trout (Salmo gairdneri)-II. Held in a Series of Contaminated Lakes. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.77(1): 77-82.
Copper	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Copper	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Copper	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Copper	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Copper	Rainbow Trout	Fish	Fresh	Growth	NR		T	225	NA	NR	ug/L	LAB	1976. Lett, P.F., G.J. Farmer, and F.W.H. Beamish. Effect of Copper on Some Aspects of the Bioenergetics of Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.33(6): 1335-1342.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NA	NR	ug/L	LAB	1996. Marr, J.C.A., J. Lipton, D. Cacela, J.A. Hansen, H.L. Bergman, J.S. Meyer, and C. Hogstrand. Relationship Between Copper Exposure Duration, Tissue Copper Concentration, and Rainbow Trout Growth. Aquat. Toxicol.36(1-2): 17-30.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	D	NR	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	489800	NR	NR	ug/L	LAB	1999. Handy, R.D., D.W. Sims, A. Giles, H.A. Campbell, and M.M. Musonda. Metabolic Trade-Off Between Locomotion and Detoxification for Maintenance of Blood Chemistry and Growth Parameters by Rainbow Trout (Oncorhynchus mykiss) During Chronic Dietary Exposure to Copper. Aquat. Toxicol.47: 23-41.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Klima, K.E., and F.M. Applehans. Copper Exposure and the Degeneration of Olfactory Receptors in Rainbow Trout (Oncorhynchus mykiss). Chem. Spec. Bioavail.2(4): 149-154.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Neville, C.M.. Short-Term Early Life Stage Growth Test Using Sacfry and Early Swim-Up Stages of Rainbow Trout (Oncorhynchus mykiss). Ontario Ministry of the Environment & Energy, Toronto, Ontario: 27 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	41.06	NR	NR	ug/L	LAB	2008. Kamunde, C., R. MacPhail, D. Mahar, and B. Grimmelt. Evaluation of Antioxidant Circulatory Lipid-Soluble Vitamins and Sodium as Non-Invasive Indicators of Chronic Copper Exposure and Toxicity in Rainbow Trout, Oncorhynchus mykiss. Bull. Environ. Contam. Toxicol.80(6): 502-506.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Gundogdu, A., and M. Erdem. The Accumulation of the Heavy Metals (Copper and Zinc) in the Tissues of Rainbow Trout (Onchorhyncus mykiss, Walbaum, 1792). J. Fish. Sci.2(1): 41-50.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Saucier, D., and L. Astic. Morpho-functional Alterations in the Olfactory System of Rainbow Trout (Oncorhynchus mykiss) and Possible Acclimation in Response to Long-Lasting Exposure to Low Copper Levels. Comp. Biochem. Physiol. A Physiol.112(2): 273-284.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	489800	NR	NR	ug/L	LAB	1999. Handy, R.D., D.W. Sims, A. Giles, H.A. Campbell, and M.M. Musonda. Metabolic Trade-Off Between Locomotion and Detoxification for Maintenance of Blood Chemistry and Growth Parameters by Rainbow Trout (Oncorhynchus mykiss) During Chronic Dietary Exposure to Copper. Aquat. Toxicol.47: 23-41.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Dethloff, G.M., and H.C. Bailey. Effects of Copper on Immune System Parameters of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.17(9): 1807-1814.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	D	NR	NR	NR	ug/L	LAB	1999. Dethloff, G.M., D. Schlenk, S. Khan, and H.C. Bailey. The Effects of Copper on Blood and Biochemical Parameters of Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.36(4): 415-423.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	796000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Effect of Ascorbic Acid on Dietary Copper Toxicity in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 269-287.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	511000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	664000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		D	30	NA	NR	ug/L	LAB	1981. Dixon, D.G., and J.B. Sprague. Acclimation to Copper by Rainbow Trout (Salmo gairdneri) - a Modifying Factor in Toxicity. Can. J. Fish. Aquat. Sci.38(8): 880-888.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		D	58	NA	NR	ug/L	LAB	1981. Dixon, D.G., and J.B. Sprague. Acclimation to Copper by Rainbow Trout (Salmo gairdneri) - a Modifying Factor in Toxicity. Can. J. Fish. Aquat. Sci.38(8): 880-888.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	21.5	NA	NR	ug/L	LAB	1982. Snarski, V.M.. The Response of Rainbow Trout Salmo gairdneri to Aeromonas hydrophila After Sublethal Exposures to PCB and Copper. Environ. Pollut. A.28(3): 219-232.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	144	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	144	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	144	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	144	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	NR	Growth	NR	Whole Organism	T	11.4	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	NR	Growth	NR	Whole Organism	T	31.7	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	EC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Wang, N., C.G. Ingersoll, D.K. Hardesty, C.D. Ivey, J.L. Kunz, T.W. May, F.J. Dwyer, A.D. Roberts, T. Augspurger, C.M. K. Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae). Environ. Toxicol. Chem.26(10): 2036-2047.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	IC10	Not Reported	T	22	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	IC10	Not Reported	T	17	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	IC10	Not Reported	T	17	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	IC10	Not Reported	T	22	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	IC25	Not Reported	T	27	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	IC25	Not Reported	T	24	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	IC25	Not Reported	T	24	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	IC25	Not Reported	T	27	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	14.2	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	4.8	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	7.3	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	9.7	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	15.7	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	2.4	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	4.7	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	10.2	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	11.9	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	3.9	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	4.6	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	11.4	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	D	11.6	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	22	NR	NR	ug/L	LAB	1978. Waiwood, K.G., and F.W.H. Beamish. Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo gairdneri Richardson). Water Res.12(8): 611-619.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Waiwood, K.G., and F.W.H. Beamish. Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo gairdneri Richardson). Water Res.12(8): 611-619.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Waiwood, K.G., and F.W.H. Beamish. Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo gairdneri Richardson). Water Res.12(8): 611-619.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Waiwood, K.G., and F.W.H. Beamish. Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo gairdneri Richardson). Water Res.12(8): 611-619.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC20	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Waiwood, K.G., and F.W.H. Beamish. Effects of Copper, pH and Hardness on the Critical Swimming Performance of Rainbow Trout (Salmo gairdneri Richardson). Water Res.12(8): 611-619.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1974. Shaw, T.L., and V.M. Brown. The Toxicity of Some Forms of Copper to Rainbow Trout. Water Res.8(6): 377-382.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1974. Shaw, T.L., and V.M. Brown. The Toxicity of Some Forms of Copper to Rainbow Trout. Water Res.8(6): 377-382.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	FIELDN	1975. Calamari, D., and R. Marchetti. Predicted and Observed Acute Toxicity of Copper and Ammonia to Rainbow Trout, (Salmo gairdneri Rich.). Prog. Water Technol.7(3-4): 569-577.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1968. Brown, V.M.. The Calculation of the Acute Toxicity of Mixtures of Poisons to Rainbow Trout. Water Res.2(10): 723-733.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1968. Brown, V.M.. The Calculation of the Acute Toxicity of Mixtures of Poisons to Rainbow Trout. Water Res.2(10): 723-733.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	93	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	94	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	52	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	56	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	41	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	105	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	1986. Roch, M., and J.A. McCarter. Survival and Hepatic Metallothionein in Developing Rainbow Trout Exposed to a Mixture of Zinc, Copper, and Cadmium. Bull. Environ. Contam. Toxicol.36: 168-175.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	55	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	84	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	87	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	87	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper chloride (CuCl)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	139	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	179	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	183	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	214	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	264	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	297	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	559	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	62.7	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	72.3	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	90.5	NR	NR	ug/L	LAB	1977. Chakoumakos, C.. The Toxicity of Copper to Rainbow and Cutthroat Trouts Under Different Conditions of Alkalinity, pH, and Hardness. M.S.Thesis, Univ.of Wisconsin, Madison, WI: 46 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	17.9		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18.1		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18.1		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	21.2		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	27.7		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	30.7		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	35.5		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	37.3		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	46.2		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	52.5		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	53.9		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	67.9		NC	ug/L	LAB	2002. Naddy, R.B., W.A. Stubblefield, J.R. May, S.A. Tucker, and J.R. Hockett. The Effect of Calcium and Magnesium Ratios on the Toxicity of Copper to Five Aquatic Species in Freshwater. Environ. Toxicol. Chem.21(2): 347-352.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
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Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	23	NR	NR	ug/L	LAB	1998. Marr, J.C.A., J.A. Hansen, J.S. Meyer, D. Cacela, T. Podrabsky, J. Lipton, and H.L. Bergman. Toxicity of Cobalt and Copper to Rainbow Trout: Application of a Mechanistic Model for Predicting Survival. Aquat. Toxicol.43(4): 225-238.
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Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	12	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	13.1	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	13.3	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	16.1	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	16.3	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	17	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	18	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	18	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	19.2	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	32.8	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	35	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	5.6	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	5.7	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	103	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	128	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	165	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	169	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18	NR	NR	ug/L	LAB	1998. Marr, J.C.A., J.A. Hansen, J.S. Meyer, D. Cacela, T. Podrabsky, J. Lipton, and H.L. Bergman. Toxicity of Cobalt and Copper to Rainbow Trout: Application of a Mechanistic Model for Predicting Survival. Aquat. Toxicol.43(4): 225-238.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	197	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	221	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	243	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	274	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	514	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	83.3	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	85.3	NA	NR	ug/L	LAB	1979. Chakoumakos, C., R.C. Russo, and R.V. Thurston. Toxicity of Copper to Cutthroat Trout (Salmo clarki) Under Different Conditions of Alkalinity, pH, and Hardness. Environ. Sci. Technol.13(2): 213-219.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	17	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	28	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	29	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.8	NA	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4.2	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	57	NR	NR	ug/L	LAB	1978. Chapman, G.A., and D.G. Stevens. Acutely Lethal Levels of Cadmium, Copper, and Zinc to Adult Male Coho Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 837-840.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	66	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	17.2	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	19	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	21	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	21.1	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	3.4	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	39.3	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	40	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	8	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15	NR	NR	ug/L	LAB	1998. Marr, J.C.A., J.A. Hansen, J.S. Meyer, D. Cacela, T. Podrabsky, J. Lipton, and H.L. Bergman. Toxicity of Cobalt and Copper to Rainbow Trout: Application of a Mechanistic Model for Predicting Survival. Aquat. Toxicol.43(4): 225-238.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	1.8	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	10.1	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	10.4	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	13.2	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	13.7	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	14.5	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	15.1	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	15.6	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	15.9	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	31.9	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	32.9	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	4	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	4.8	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	5.1	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	9.1	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	9.9	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.3	NA	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3.1	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	36.7	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	15.2	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	15.2	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	15.9	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	16.6	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	17.9	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	40.1	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	43.4	NR	NR	ug/L	LAB	2008. Welsh, P.G., J. Lipton, C.A. Mebane, and J.C.A. Marr. Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout. Ecotoxicol. Environ. Saf.69(2): 199-208.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	17	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	21	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	26	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
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Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	NR	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper oxide (CuO)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	25400	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Nitric acid, Copper(2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	253	NR	NR	ug/L	LAB	1977. Hale, J.G.. Toxicity of Metal Mining Wastes. Bull. Environ. Contam. Toxicol.17(1): 66-73.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	56		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	16		NC	ug/L	LAB	2000. Taylor, L.N., J.C. McGeer, C.M. Wood, and D.G. McDonald. Physiological Effects of Chronic Copper Exposure to Rainbow Trout (Oncorhynchus mykiss) in Hard and Soft Water: Evaluation of Chronic Indicators. Environ. Toxicol. Chem.19(9): 2298-2308.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	91		NC	ug/L	LAB	2000. Taylor, L.N., J.C. McGeer, C.M. Wood, and D.G. McDonald. Physiological Effects of Chronic Copper Exposure to Rainbow Trout (Oncorhynchus mykiss) in Hard and Soft Water: Evaluation of Chronic Indicators. Environ. Toxicol. Chem.19(9): 2298-2308.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.1		NC	umol/L	LAB	2003. Taylor, L.N., C.M. Wood, and D.G. McDonald. An Evaluation of Sodium Loss and Gill Metal Binding Properties in Rainbow Trout and Yellow Perch to Explain Species Differences in Copper Tolerance. Environ. Toxicol. Chem.22(9): 2159-2166.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.05		NC	umol/L	LAB	2003. Taylor, L.N., C.M. Wood, and D.G. McDonald. An Evaluation of Sodium Loss and Gill Metal Binding Properties in Rainbow Trout and Yellow Perch to Explain Species Differences in Copper Tolerance. Environ. Toxicol. Chem.22(9): 2159-2166.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	42		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	58		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	83		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	810	NA	NR	ug/L	LAB	1973. Calamari, D., and R. Marchetti. The Toxicity of Mixtures of Metals and Surfactants to Rainbow Trout (Salmo gairdneri Rich.). Water Res.7(10): 1453-1464.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	48	NR	NR	ug/L	LAB	1971. Goettl, J.P.. Water Pollution Studies. Fed.Aid Proj.No.F-33-R-6, Colorado Game, Fish and Parks Div., Div.Wildl., Ft.Collins, CO: 130 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	910	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	490	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1030	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	420	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	440	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1250	NA	NR	ug/L	LAB	1973. Calamari, D., and R. Marchetti. The Toxicity of Mixtures of Metals and Surfactants to Rainbow Trout (Salmo gairdneri Rich.). Water Res.7(10): 1453-1464.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	72	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	970	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	150	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1981. Bills, T.D., L.L. Marking, and W.L. Mauck. Polychlorinated Biphenyl (Aroclor 1254) Residues in Rainbow Trout: Effects on Sensitivity to Nine Fishery Chemicals. N. Am. J. Fish. Manag.1(2): 200-203.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18.9	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	430	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	46.4	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	950	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	29	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	870	NA	NR	ug/L	LAB	1973. Calamari, D., and R. Marchetti. The Toxicity of Mixtures of Metals and Surfactants to Rainbow Trout (Salmo gairdneri Rich.). Water Res.7(10): 1453-1464.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1330	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	242	NA	NR	ug/L	LAB	1977. Fogels, A., and J.B. Sprague. Comparative Short-Term Tolerance of Zebrafish, Flagfish, and Rainbow Trout to Five Poisons Including Potential Reference Toxicants. Water Res.11(9): 811-817.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	710	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	190*	NA	NR	ug/L	LAB	1970. Brown, V.M., and R.A. Dalton. The Acute Lethal Toxicity to Rainbow Trout of Mixtures of Copper, Phenol, Zinc and Nickel. J. Fish Biol.2(3): 211-216.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	510	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1964. Herbert, D.W.M., and J.M. Vandyke. The Toxicity to Fish of Mixtures of Poisons. II. Copper-Ammonia and Zinc-Phenol Mixtures. Ann. Appl. Biol.53(3): 415-421.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	42	NA	NR	ug/L	LAB	1993. Waller, D.L., J.J. Rach, W.G. Cope, L.L. Marking, S.W. Fisher, and H. Dabrowska. Toxicity of Candidate Molluscicides to Zebra Mussels (Dreissena polymorpha) and Selected Nontarget Organisms. J. Great Lakes Res.19(4): 695-702.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	580	NA	NR	ug/L	LAB	1974. Brown, V.M., T.L. Shaw, and D.G. Shurben. Aspects of Water Quality and the Toxicity of Copper to Rainbow Trout. Water Res.8(10): 797-803.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	690	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.17		NR	umol/g	LAB	2003. Kamunde, C., and C.M. Wood. The Influence of Ration Size on Copper Homeostasis During Sublethal Dietary Copper Exposure in Juvenile Rainbow Trout, Oncorhynchus mykiss. Aquat. Toxicol.62(3): 235-254.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NR	NR	ug/L	LAB	1977. Spear, P.. Copper Accumulation Kinetics and Lethal Tolerance in Relation to Fish Size. M.S.Thesis, Concordia Univ., Montreal, Canada: 69 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1977. Spear, P.. Copper Accumulation Kinetics and Lethal Tolerance in Relation to Fish Size. M.S.Thesis, Concordia Univ., Montreal, Canada: 69 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NR	NR	ug/L	LAB	1977. Spear, P.. Copper Accumulation Kinetics and Lethal Tolerance in Relation to Fish Size. M.S.Thesis, Concordia Univ., Montreal, Canada: 69 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	22	NR	NR	ug/L	LAB	1971. Goettl, J.P.. Water Pollution Studies. Fed.Aid Proj.No.F-33-R-6, Colorado Game, Fish and Parks Div., Div.Wildl., Ft.Collins, CO: 130 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	25	NR	NR	ug/L	LAB	1971. Goettl, J.P.. Water Pollution Studies. Fed.Aid Proj.No.F-33-R-6, Colorado Game, Fish and Parks Div., Div.Wildl., Ft.Collins, CO: 130 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	34	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.17		NR	umol/g	LAB	2003. Kamunde, C., and C.M. Wood. The Influence of Ration Size on Copper Homeostasis During Sublethal Dietary Copper Exposure in Juvenile Rainbow Trout, Oncorhynchus mykiss. Aquat. Toxicol.62(3): 235-254.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	153		NR	ug/L	LAB	2000. Taylor, L.N., J.C. McGeer, C.M. Wood, and D.G. McDonald. Physiological Effects of Chronic Copper Exposure to Rainbow Trout (Oncorhynchus mykiss) in Hard and Soft Water: Evaluation of Chronic Indicators. Environ. Toxicol. Chem.19(9): 2298-2308.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	111	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	176	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	19.9	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	22.4	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	232	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	28.9	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	298	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	30	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	30	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	30.7	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	309	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	33.1	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	40	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	46.3	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	47.9	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	48.1	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	516	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	70	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	81.1	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	82.2	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	85.9	NA	NR	ug/L	LAB	1978. Howarth, R.S., and J.B. Sprague. Copper Lethality to Rainbow Trout in Waters of Various Hardness and pH. Water Res.12(7): 455-462.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	102	NA	NR	ug/L	LAB	1977. Fogels, A., and J.B. Sprague. Comparative Short-Term Tolerance of Zebrafish, Flagfish, and Rainbow Trout to Five Poisons Including Potential Reference Toxicants. Water Res.11(9): 811-817.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1980. Anderson, P.D., and P.A. Spear. Copper Pharmacokinetics in Fish Gills-II Body Size Relationships for Accumulation and Tolerance. Water Res.14(8): 1107-1111.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1980. Anderson, P.D., and P.A. Spear. Copper Pharmacokinetics in Fish Gills-II Body Size Relationships for Accumulation and Tolerance. Water Res.14(8): 1107-1111.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1980. Anderson, P.D., and P.A. Spear. Copper Pharmacokinetics in Fish Gills-II Body Size Relationships for Accumulation and Tolerance. Water Res.14(8): 1107-1111.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	890	NA	NR	ug/L	LAB	1973. Calamari, D., and R. Marchetti. The Toxicity of Mixtures of Metals and Surfactants to Rainbow Trout (Salmo gairdneri Rich.). Water Res.7(10): 1453-1464.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	1981. Daoust, P.Y.. Acute Pathological Effects of Mercury, Cadmium and Copper in Rainbow Trout. Ph.D.Thesis, Saskatoon, Saskatchewan: 331 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	650	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NR	NR	ug/L	LAB	1974. Mayer, F.L.,Jr.. Pesticides as Pollutants. In: B.G.Liptak (Ed.), Environmental Engineer's Handbook, Chilton Book Co., Radnor, PA: 405-418.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1982. Giles, M.A., and J.F. Klaverkamp. The Acute Toxicity of Vanadium and Copper to Eyed Eggs of Rainbow Trout (Salmo gairdneri). Water Res.16(6): 885-889.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5660	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	94	NR	NR	ug/L	LAB	2008. Gundogdu, A.. Acute Toxicity of Zinc and Copper for Rainbow Trout (Onchorhyncus mykiss). J. Fish. Sci.2(5): 711-721.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1150	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	430	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	930	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	235	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1979. Craig, G.R., and G.L. Beggs. Evaluation of Fish Loading Rates in Regulatory Static Bioassays. Tech.Rep.Fish.Mar.Serv.#862: 146-160.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	135	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	1200	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	1200	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	130	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	2280	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	32	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	185	NA	NR	ug/L	LAB	1981. Bills, T.D., L.L. Marking, and W.L. Mauck. Polychlorinated Biphenyl (Aroclor 1254) Residues in Rainbow Trout: Effects on Sensitivity to Nine Fishery Chemicals. N. Am. J. Fish. Manag.1(2): 200-203.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11.3	NA	NR	ug/L	LAB	1984. Marking, L.L., T.D. Bills, and J.R. Crowther. Effects of Five Diets on Sensitivity of Rainbow Trout to Eleven Chemicals. Prog. Fish-Cult.46(1): 1-5.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11.3	NA	NR	ug/L	LAB	1984. Marking, L.L., T.D. Bills, and J.R. Crowther. Effects of Five Diets on Sensitivity of Rainbow Trout to Eleven Chemicals. Prog. Fish-Cult.46(1): 1-5.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13.8	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	14.3	NA	NR	ug/L	LAB	1984. Marking, L.L., T.D. Bills, and J.R. Crowther. Effects of Five Diets on Sensitivity of Rainbow Trout to Eleven Chemicals. Prog. Fish-Cult.46(1): 1-5.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15.9	NA	NR	ug/L	LAB	1984. Marking, L.L., T.D. Bills, and J.R. Crowther. Effects of Five Diets on Sensitivity of Rainbow Trout to Eleven Chemicals. Prog. Fish-Cult.46(1): 1-5.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	23.9	NA	NR	ug/L	LAB	1984. Marking, L.L., T.D. Bills, and J.R. Crowther. Effects of Five Diets on Sensitivity of Rainbow Trout to Eleven Chemicals. Prog. Fish-Cult.46(1): 1-5.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	36	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	64*	NA	NR	ug/L	LAB	1982. Qureshi, A.A., K.W. Flood, S.R. Thompson, S.M. Janhurst, C.S. Inniss, and D.A. Rokosh. Comparison of a Luminescent Bacterial Test with Other Bioassays for Determining Toxicity of Pure Compounds and Complex Effluents. In: J.G.Pearson, R.B.Foster and W.E.Bishop (Eds.), Aquatic Toxicology and Hazard Assessment, 5th Confrence, ASTM STP 766, Philadelphia, PA: 179-195.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	319	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	327	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	333	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	348	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	523	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	566	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	569	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	590	NA	NR	ug/L	LAB	1993. Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. Relative Contributions of Dietary and Waterborne Copper to Tissue Copper Burdens and Waterborne-Copper Tolerance in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.5(8): 1683-1689.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18	NR	NR	ug/L	LAB	1993. Hickie, B.E., N.J. Hutchinson, D.G. Dixon, and P.V. Hodson. Toxicity of Trace Metal Mixtures to Alevin Rainbow Trout (Oncorhynchus mykiss) and Larval Fathead Minnow (Pimephales promelas) in Soft, Acidic Water. Can. J. Fish. Aquat. Sci.50: 1348-1355.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	19	NR	NR	ug/L	LAB	1993. Hickie, B.E., N.J. Hutchinson, D.G. Dixon, and P.V. Hodson. Toxicity of Trace Metal Mixtures to Alevin Rainbow Trout (Oncorhynchus mykiss) and Larval Fathead Minnow (Pimephales promelas) in Soft, Acidic Water. Can. J. Fish. Aquat. Sci.50: 1348-1355.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	23	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1980. Black, J.A., and W.J. Birge. An Avoidance Response Bioassay for Aquatic Pollutants. Res.Report No.123, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 34-180490.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	341	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	462	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	550	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	NR	Mortality	LC50	Not Reported	T	220*	NA	NR	ug/L	LAB	1980. Svobodova, Z.. Acute Toxicity of Pesticides to Fish (Akutni Toxicita Pesticidu pro Ryby). Agrochemia (Bratisl.)20(11): 328-332.
Sulfuric acid copper(2+)salt basic	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	200	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+)salt basic	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	2700	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+)salt basic	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	470	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Sulfuric acid copper(2+)salt basic	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	5100	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Copper	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	250	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LD1	Not Reported	T	10000		NC	ug/L	LAB	2008. Taylor, P.W., and R.A. Glenn. Toxicity of Five Therapeutic Compounds on Juvenile Salmonids. N. Am. J. Aquacult.70(2): 175-183.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LD50	Not Reported	T	35000		NC	ug/L	LAB	2008. Taylor, P.W., and R.A. Glenn. Toxicity of Five Therapeutic Compounds on Juvenile Salmonids. N. Am. J. Aquacult.70(2): 175-183.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LD50	Not Reported	T	39000		NC	ug/L	LAB	2008. Taylor, P.W., and R.A. Glenn. Toxicity of Five Therapeutic Compounds on Juvenile Salmonids. N. Am. J. Aquacult.70(2): 175-183.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	14	NR	NR	ug/L	LAB	1998. Marr, J.C.A., J.A. Hansen, J.S. Meyer, D. Cacela, T. Podrabsky, J. Lipton, and H.L. Bergman. Toxicity of Cobalt and Copper to Rainbow Trout: Application of a Mechanistic Model for Predicting Survival. Aquat. Toxicol.43(4): 225-238.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	18	NR	NR	ug/L	LAB	1980. Miller, T.G., and W.C. Mackay. The Effects of Hardness, Alkalinity and pH of Test Water on the Toxicity of Copper to Rainbow Trout (Salmo gairdneri). Water Res.14(2): 129-133.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	19	NR	NR	ug/L	LAB	1980. Miller, T.G., and W.C. Mackay. The Effects of Hardness, Alkalinity and pH of Test Water on the Toxicity of Copper to Rainbow Trout (Salmo gairdneri). Water Res.14(2): 129-133.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	46	NR	NR	ug/L	LAB	1980. Miller, T.G., and W.C. Mackay. The Effects of Hardness, Alkalinity and pH of Test Water on the Toxicity of Copper to Rainbow Trout (Salmo gairdneri). Water Res.14(2): 129-133.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	48	NR	NR	ug/L	LAB	1980. Miller, T.G., and W.C. Mackay. The Effects of Hardness, Alkalinity and pH of Test Water on the Toxicity of Copper to Rainbow Trout (Salmo gairdneri). Water Res.14(2): 129-133.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	48	NR	NR	ug/L	LAB	1980. Miller, T.G., and W.C. Mackay. The Effects of Hardness, Alkalinity and pH of Test Water on the Toxicity of Copper to Rainbow Trout (Salmo gairdneri). Water Res.14(2): 129-133.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	54	NR	NR	ug/L	LAB	1980. Miller, T.G., and W.C. Mackay. The Effects of Hardness, Alkalinity and pH of Test Water on the Toxicity of Copper to Rainbow Trout (Salmo gairdneri). Water Res.14(2): 129-133.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	63	NR	NR	ug/L	LAB	1980. Miller, T.G., and W.C. Mackay. The Effects of Hardness, Alkalinity and pH of Test Water on the Toxicity of Copper to Rainbow Trout (Salmo gairdneri). Water Res.14(2): 129-133.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	78	NR	NR	ug/L	LAB	1980. Miller, T.G., and W.C. Mackay. The Effects of Hardness, Alkalinity and pH of Test Water on the Toxicity of Copper to Rainbow Trout (Salmo gairdneri). Water Res.14(2): 129-133.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	96	NR	NR	ug/L	LAB	1980. Miller, T.G., and W.C. Mackay. The Effects of Hardness, Alkalinity and pH of Test Water on the Toxicity of Copper to Rainbow Trout (Salmo gairdneri). Water Res.14(2): 129-133.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	19	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	22	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	29	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	19	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	35.7	D	34.4	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	59		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	22	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	22	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	22.4	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	22.4	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	500	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	250	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	1000	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	60	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	60	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	60	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	60	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Copper	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Copper	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	40		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	16	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	16	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Copper	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	12	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	24	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	28	NR	NR	ug/L	LAB	1993. Mudge, J.E., T.E. Northstrom, G.S. Jeane, W. Davis, and J.L. Hickam. Effect of Varying Environmental Conditions on the Toxicity of Copper to Salmon. In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.La Point (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA: 19-33.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	12	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	22.2	D	21.7	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	27		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	12	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	12	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	11.8	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	11.8	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	15	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	250	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	130	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	500	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	30	NR	NR	ug/L	LAB	2005. Stasiunaite, P.. Toxicity of Copper to Embryonic Development of Rainbow Trout (Oncorhynchus mykiss). Acta Zool. Litu.15(3): 259-265.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	uM	LAB	1983. Leland, H.V.. Ultrastructural Changes in the Hepatocytes of Juvenile Rainbow Trout and Mature Brown Trout Exposed to Copper or Zinc. Environ. Toxicol. Chem.2(3): 353-368.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1984. Roch, M., and J.A. McCarter. Hepatic Metallothionein Production and Resistance to Heavy Metals by Rainbow Trout (Salmo gairdneri)-II. Held in a Series of Contaminated Lakes. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.77(1): 77-82.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1974. Shaw, T.L., and V.M. Brown. The Toxicity of Some Forms of Copper to Rainbow Trout. Water Res.8(6): 377-382.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1974. Shaw, T.L., and V.M. Brown. The Toxicity of Some Forms of Copper to Rainbow Trout. Water Res.8(6): 377-382.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1974. Shaw, T.L., and V.M. Brown. The Toxicity of Some Forms of Copper to Rainbow Trout. Water Res.8(6): 377-382.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1974. Shaw, T.L., and V.M. Brown. The Toxicity of Some Forms of Copper to Rainbow Trout. Water Res.8(6): 377-382.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	85	NA	NR	ug/L	LAB	1982. Miller, T.G., and W.C. Mackay. Relationship of Secreted Mucus to Copper and Acid Toxicity in Rainbow Trout. Bull. Environ. Contam. Toxicol.28(1): 68-74.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	19	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4	NA	NR	ug/L	LAB	1979. Hetrick, F.M., M.D. Knittel, and J.L. Fryer. Increased Susceptibility of Rainbow Trout to Infectious Hematopoietic Necrosis Virus After Exposure to Copper. Appl. Environ. Microbiol.37(2): 198-201.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	5.1	NA	NR	ug/L	LAB	1979. Hetrick, F.M., M.D. Knittel, and J.L. Fryer. Increased Susceptibility of Rainbow Trout to Infectious Hematopoietic Necrosis Virus After Exposure to Copper. Appl. Environ. Microbiol.37(2): 198-201.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	5.8	NA	NR	ug/L	LAB	1979. Hetrick, F.M., M.D. Knittel, and J.L. Fryer. Increased Susceptibility of Rainbow Trout to Infectious Hematopoietic Necrosis Virus After Exposure to Copper. Appl. Environ. Microbiol.37(2): 198-201.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	9.5	NA	NR	ug/L	LAB	1979. Hetrick, F.M., M.D. Knittel, and J.L. Fryer. Increased Susceptibility of Rainbow Trout to Infectious Hematopoietic Necrosis Virus After Exposure to Copper. Appl. Environ. Microbiol.37(2): 198-201.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	9.6	NA	NR	ug/L	LAB	1979. Hetrick, F.M., M.D. Knittel, and J.L. Fryer. Increased Susceptibility of Rainbow Trout to Infectious Hematopoietic Necrosis Virus After Exposure to Copper. Appl. Environ. Microbiol.37(2): 198-201.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	91	NR	NR	ug/L	LAB	2002. Hansen, J.A., J. Lipton, P.G. Welsh, J. Morris, D. Cacela, and M.J. Suedkamp. Relationship Between Exposure Duration, Tissue Residues, Growth, and Mortality in Rainbow Trout (Oncorhynchus mykiss) Juveniles Sub-chronically Exposed to Copper. Aquat. Toxicol.58(3-4): 175-188.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	M	LAB	1973. Bilinski, E., and R.E.E. Jonas. Effects of Cadmium and Copper on the Oxidation of Lactate by Rainbow Trout (Salmo gairdneri) Gills. J. Fish. Res. Board Can.30(10): 1553-1558.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	121	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
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Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	16	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.

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Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	57	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
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Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	10.6	NA	NR	ug/L	LAB	1981. Knittel, M.D.. Susceptibility of Steelhead Trout Salmo gairdneri Richardson to Redmouth Infection Yersinia ruckeri Following Exposure to Copper. J. Fish Dis.4(1): 33-40.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	121	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
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Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	31	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	57	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	9	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
Nitric acid, Copper(2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4.88	NA	NR	umol/L	LAB	1993. Wilson, R.W., and E.W. Taylor. The Physiological Responses of Freshwater Rainbow Trout, Oncorhynchus mykiss, During Acutely Lethal Copper Exposure. J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.163(1): 38-47.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	2000. Taylor, L.N., J.C. McGeer, C.M. Wood, and D.G. McDonald. Physiological Effects of Chronic Copper Exposure to Rainbow Trout (Oncorhynchus mykiss) in Hard and Soft Water: Evaluation of Chronic Indicators. Environ. Toxicol. Chem.19(9): 2298-2308.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	2000. Taylor, L.N., J.C. McGeer, C.M. Wood, and D.G. McDonald. Physiological Effects of Chronic Copper Exposure to Rainbow Trout (Oncorhynchus mykiss) in Hard and Soft Water: Evaluation of Chronic Indicators. Environ. Toxicol. Chem.19(9): 2298-2308.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1966. Grande, M.. Effect of Copper and Zinc on Salmonid Fishes. Adv. Water Pollut. Res.3(1): 97-111.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Neville, C.M.. Short-Term Early Life Stage Growth Test Using Sacfry and Early Swim-Up Stages of Rainbow Trout (Oncorhynchus mykiss). Ontario Ministry of the Environment & Energy, Toronto, Ontario: 27 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	91	NA	NR	ug/L	LAB	1995. Neville, C.M.. Short-Term Early Life Stage Growth Test Using Sacfry and Early Swim-Up Stages of Rainbow Trout (Oncorhynchus mykiss). Ontario Ministry of the Environment & Energy, Toronto, Ontario: 27 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1966. Grande, M.. Effect of Copper and Zinc on Salmonid Fishes. Adv. Water Pollut. Res.3(1): 97-111.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	87.7	NR	NR	ug/L	LAB	2006. Gagnon, A., C. Jumarie, and A. Hontela. Effects of Cu on Plasma Cortisol and Cortisol Secretion by Adrenocortical Cells of Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.78(1): 59-65.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	282000	NR	NR	ug/L	LAB	2002. Kamunde, C., M. Grosell, D. Higgs, and C.M. Wood. Copper Metabolism in Actively Growing Rainbow Trout (Oncorhynchus mykiss): Interactions Between Dietary and Waterborne Copper Uptake. J. Exp. Biol.205: 279-290.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1988. Julshamn, K., K.J. Andersen, O. Ringdal, and J. Brenna. Effect of Dietary Copper on the Hepatic Concentration and Subcellular Distribution of Copper and Zinc in the Rainbow Trout (Salmo gairdneri). Aquaculture73: 143-155.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	726000	NR	NR	ug/L	LAB	2002. Campbell, H.A., R.D. Handy, and D.W. Sims. Increased Metabolic Cost of Swimming and Consequent Alterations to Circadian Activity in Rainbow Trout (Oncorhynchus mykiss) Exposed to Dietary Copper. Can. J. Fish. Aquat. Sci.59(5): 768-777.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	D	NR	NR	NR	ug/L	LAB	1999. Dethloff, G.M., D. Schlenk, S. Khan, and H.C. Bailey. The Effects of Copper on Blood and Biochemical Parameters of Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.36(4): 415-423.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Dethloff, G.M., and H.C. Bailey. Effects of Copper on Immune System Parameters of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.17(9): 1807-1814.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	500	NR	NR	ug/L	LAB	1996. Vosyliene, M.Z.. Haematological Parameters of Rainbow Trout (Oncorhynchus mykiss) During Short-Term Exposure to Copper. Ekologija3: 12-18.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	0.39	NA	NR	uM	LAB	1997. Hollis, L., L. Muench, and R.C. Playle. Influence of Dissolved Organic Matter on Copper Binding, and Calcium on Cadmium Binding, by Gills of Rainbow Trout. J. Fish Biol.50: 703-720.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Saucier, D., and L. Astic. Morpho-functional Alterations in the Olfactory System of Rainbow Trout (Oncorhynchus mykiss) and Possible Acclimation in Response to Long-Lasting Exposure to Low Copper Levels. Comp. Biochem. Physiol. A Physiol.112(2): 273-284.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	D	31	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6	NA	NR	umol/L	LAB	1988. Reid, S.D., and D.G. McDonald. Effects of Cadmium, Copper, and Low pH on Ion Fluxes in the Rainbow Trout, Salmo gairdneri. Can. J. Fish. Aquat. Sci.45(2): 244-253.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6	NA	NR	umol/L	LAB	1988. Reid, S.D., and D.G. McDonald. Effects of Cadmium, Copper, and Low pH on Ion Fluxes in the Rainbow Trout, Salmo gairdneri. Can. J. Fish. Aquat. Sci.45(2): 244-253.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	796000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Effect of Ascorbic Acid on Dietary Copper Toxicity in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 269-287.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	132000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	258000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	403000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	511000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	664000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	21.5	NA	NR	ug/L	LAB	1982. Snarski, V.M.. The Response of Rainbow Trout Salmo gairdneri to Aeromonas hydrophila After Sublethal Exposures to PCB and Copper. Environ. Pollut. A.28(3): 219-232.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1585000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	171000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	287000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	3088000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	37000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	730000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	83000	NA	NR	ug/L	LAB	1985. Lanno, R.P., S.J. Slinger, and J.W. Hilton. Maximum Tolerable and Toxicity Levels of Dietary Copper in Rainbow Trout (Salmo gairdneri Richardson). Aquaculture49(3-4): 257-268.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	86	NA	NR	ug/L	LAB	1977. Hodson, P.V., B.R. Blunt, D.J. Spry, and K. Austen. Evaluation of Erythrocyte delta-Amino Levulinic Acid Dehydratase Activity as a Short-Term Indicator in Fish of a Harmful Exposure to Lead. J. Fish. Res. Board Can.34(4): 501-508.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	144	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	144	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	144	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	144	NA	NR	ug/L	LAB	1985. Dixon, D.G., and J.W. Hilton. Effects of Available Dietary Carbohydrate and Water Temperature on the Chronic Toxicity of Waterborne Copper to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 1007-1013.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4.9	NR	NR	uM	LAB	1994. Taylor, E.W., and R.W. Wilson. The Physiological Responses of Rainbow Trout to Copper and Ammonia: Mechanisms of Toxicity and Ammonia Excretion. In: D.J.Randall, H.Xiang and R.V.Thurston (Eds.), EPA-600-R-94-138, Fish Physiology, Toxicology and Water Quality Management, U.S.EPA, Athens, GA: 36-46.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	62	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	42.4	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	42.8	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	42	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	24.7	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	750	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	121	NA	NR	ug/L	LAB	1984. Seim, W.K., L.R. Curtis, S.W. Glenn, and G.A. Chapman. Growth and Survival of Developing Steelhead Trout (Salmo gairdneri) Continuously or Intermittently Exposed to Copper. Can. J. Fish. Aquat. Sci.41(3): 433-438.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	44.2	NR	NR	ug/L	LAB	1996. Cacela, D., R. Hudson, J. Lipton, J. Marr, T. Podrabsky, and P. Welsh. Preliminary Toxicological Evaulation U.S. v. Iron Mountain Mines, Inc. Vol. 1 Data Report. Report, Prepared for Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of the Attorney General by Hagler Bailly Consulting Inc., Boulder, CO: 53 p..
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	29	NR	NR	ug/L	LAB	1998. Welsh, P., J. Lipton, R. Hudson, T. Podrabsky, and D. Cacela. Data Report: Acute Copper Toxicity to Salmonids in Surface Waters in the Vicinity of the Iron Moutain Mine, California. Volume I: Study Objectives, Methods Summary, Water Chemistry Characterization and Toxicity Test Re. Report Prepared by Hagler Baily Services, Inc.for: Breidenbach, Buckley, Huchting, Halm & Hamblet, California Office of Attorney General: 142 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	240		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	54		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	72.2	NA	NR	ug/L	LAB	1990. Klima, K.E., and F.M. Applehans. Copper Exposure and the Degeneration of Olfactory Receptors in Rainbow Trout (Oncorhynchus mykiss). Chem. Spec. Bioavail.2(4): 149-154.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	424	NR	NR	ug/L	LAB	2002. Taylor, L.N.. Physiological Indicators of Waterborne Copper Toxicity in Freshwater Fish. Ph.D.Thesis, McMaster Univ., Hamilton, Ontario: 224 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	290	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	56	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	402	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	12	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	800	NA	NR	ug/L	LAB	1996. Hansen, H.J.M., A.G. Olsen, and P. Rosenkilde. The Effect of Cu on Gill and Esophagus Lipid Metabolism in the Rainbow Trout (Oncorhynchus mykiss). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.113(1): 23-29.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	12	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	400	NA	NR	ug/L	LAB	1996. Hansen, H.J.M., A.G. Olsen, and P. Rosenkilde. The Effect of Cu on Gill and Esophagus Lipid Metabolism in the Rainbow Trout (Oncorhynchus mykiss). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.113(1): 23-29.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.16	NA	NR	uM	LAB	1983. Leland, H.V.. Ultrastructural Changes in the Hepatocytes of Juvenile Rainbow Trout and Mature Brown Trout Exposed to Copper or Zinc. Environ. Toxicol. Chem.2(3): 353-368.
Copper	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	12	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	19.25	NR	NR	ug/L	LAB	1983. Baker, R.J., M.D. Knittel, and J.L. Fryer. Susceptibility of Chinook Salmon, Oncorhynchus tshawytscha (Walbaum), and Rainbow Trout, Salmo gairdneri Richardson, to Infection with Vibrio anguillarum Following Sublethal Copper Exposure. J. Fish Dis.6(3): 267-275.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3.9	NR	NR	ug/L	LAB	1983. Baker, R.J., M.D. Knittel, and J.L. Fryer. Susceptibility of Chinook Salmon, Oncorhynchus tshawytscha (Walbaum), and Rainbow Trout, Salmo gairdneri Richardson, to Infection with Vibrio anguillarum Following Sublethal Copper Exposure. J. Fish Dis.6(3): 267-275.
Copper chloride (CuCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.95	NA	NR	umol/L	LAB	1994. Zia, S., and D.G. McDonald. Role of the Gills and Gill Chloride Cells in Metal Uptake in the Freshwater-Adapted Rainbow Trout, Oncorhynchus mykiss. Can. J. Fish. Aquat. Sci.51(11): 2482-2492.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	108		NC	nmol/L	LAB	2002. McGeer, J.C., C. Szebedinszky, D.G. McDonald, and C.M. Wood. The Role of Dissolved Organic Carbon in Moderating the Bioavailability and Toxicity of Cu to Rainbow Trout During Chronic Waterborne Exposure. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 147-160.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	111		NC	nmol/L	LAB	2002. McGeer, J.C., C. Szebedinszky, D.G. McDonald, and C.M. Wood. The Role of Dissolved Organic Carbon in Moderating the Bioavailability and Toxicity of Cu to Rainbow Trout During Chronic Waterborne Exposure. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 147-160.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	111		NC	nmol/L	LAB	2002. McGeer, J.C., C. Szebedinszky, D.G. McDonald, and C.M. Wood. The Role of Dissolved Organic Carbon in Moderating the Bioavailability and Toxicity of Cu to Rainbow Trout During Chronic Waterborne Exposure. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 147-160.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	12		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	27		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	27		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	49.6	NA	NR	ug/L	LAB	1990. Klima, K.E., and F.M. Applehans. Copper Exposure and the Degeneration of Olfactory Receptors in Rainbow Trout (Oncorhynchus mykiss). Chem. Spec. Bioavail.2(4): 149-154.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.65	NR	NR	uM	LAB	2004. Van Heerden, D., A. Vosloo, and M. Nikinmaa. Effects of Short-Term Copper Exposure on Gill Structure, Metallothionein and Hypoxia-Inducible Factor-1alpha (HIF-1alpha) Levels in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.69(3): 271-280.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	13.5	NR	NR	ug/L	LAB	1999. Dethloff, G.M., D. Schlenk, J.T. Hamm, and H.C. Bailey. Alterations in Physiological Parameters of Rainbow Trout (Oncorhynchus mykiss) with Exposure to Copper and Copper/Zinc Mixtures. Ecotoxicol. Environ. Saf.42(3): 253-264.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	41.06	NR	NR	ug/L	LAB	2008. Kamunde, C., R. MacPhail, D. Mahar, and B. Grimmelt. Evaluation of Antioxidant Circulatory Lipid-Soluble Vitamins and Sodium as Non-Invasive Indicators of Chronic Copper Exposure and Toxicity in Rainbow Trout, Oncorhynchus mykiss. Bull. Environ. Contam. Toxicol.80(6): 502-506.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1041900		NR	ug/L	LAB	2001. Kamunde, C.N., M. Grosell, J.N.A. Lott, and C.M. Wood. Copper Metabolism and Gut Morphology in Rainbow Trout (Oncorhynchus mykiss) During Chronic Sublethal Dietary Copper Exposure. Can. J. Fish. Aquat. Sci.58(2): 293-305.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	600	NR	NR	ug/L	LAB	2008. Atamanalp, M., T. Sisman, F. Geyikoglu, and A. Topal. The Histopathological Effects of Copper Sulphate on Rainbow Trout Liver (Oncorhynchus mykiss). J. Fish. Aquat. Sci.3(5): 291-297.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Gagnon, A., C. Jumarie, and A. Hontela. Effects of Cu on Plasma Cortisol and Cortisol Secretion by Adrenocortical Cells of Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.78(1): 59-65.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	420	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	250	NR	NR	ug/L	LAB	1996. Vosyliene, M.Z.. Haematological Parameters of Rainbow Trout (Oncorhynchus mykiss) During Short-Term Exposure to Copper. Ekologija3: 12-18.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	721000	NR	NR	ug/L	LAB	2005. Campbell, H.A., R.D. Handy, and D.W. Sims. Shifts in a Fish's Resource Holding Power During a Contact Paired Interaction: The Influence of a Copper-Contaminated Diet in Rainbow Trout. Physiol. Biochem. Zool.78(5): 706-714.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	603000	NR	NR	ug/L	LAB	1988. Julshamn, K., K.J. Andersen, O. Ringdal, and J. Brenna. Effect of Dietary Copper on the Hepatic Concentration and Subcellular Distribution of Copper and Zinc in the Rainbow Trout (Salmo gairdneri). Aquaculture73: 143-155.
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.47	NA	NR	uM	LAB	1997. Hollis, L., L. Muench, and R.C. Playle. Influence of Dissolved Organic Matter on Copper Binding, and Calcium on Cadmium Binding, by Gills of Rainbow Trout. J. Fish Biol.50: 703-720.
Copper	Rainbow Trout	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Sulfuric acid copper(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Reproduction	NR		T	500	NA	NR	ug/L	LAB	1985. Billard, R., and P. Roubaud. The Effect of Metals and Cyanide on Fertilization in Rainbow Trout (Salmo gairdneri). Water Res.19(2): 209-214.
Sulfuric acid copper(2+) salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	2133	NA	NR	ug/L	LAB	1980. Durve, V.S., P.K. Gupta, and B.S. Khangarot. Toxicity of Copper to the Freshwater Teleost Rasbora daniconius neilgeriensis (Ham.). Natl. Acad. Sci. Lett.3(7): 221-223.
Sulfuric acid copper(2+) salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	2133	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	730	NA	NR	ug/L	LAB	1980. Durve, V.S., P.K. Gupta, and B.S. Khangarot. Toxicity of Copper to the Freshwater Teleost Rasbora daniconius neilgeriensis (Ham.). Natl. Acad. Sci. Lett.3(7): 221-223.
Sulfuric acid copper(2+) salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	730	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	570	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	571	NA	NR	ug/L	LAB	1980. Durve, V.S., P.K. Gupta, and B.S. Khangarot. Toxicity of Copper to the Freshwater Teleost Rasbora daniconius neilgeriensis (Ham.). Natl. Acad. Sci. Lett.3(7): 221-223.
Sulfuric acid copper(2+) salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	265	NA	NR	ug/L	LAB	1980. Durve, V.S., P.K. Gupta, and B.S. Khangarot. Toxicity of Copper to the Freshwater Teleost Rasbora daniconius neilgeriensis (Ham.). Natl. Acad. Sci. Lett.3(7): 221-223.
Sulfuric acid copper(2+) salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	203	NA	NR	ug/L	LAB	1980. Durve, V.S., P.K. Gupta, and B.S. Khangarot. Toxicity of Copper to the Freshwater Teleost Rasbora daniconius neilgeriensis (Ham.). Natl. Acad. Sci. Lett.3(7): 221-223.
Sulfuric acid copper(2+) salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	203	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	550	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	385	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	390	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	390	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	438	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	305	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	520	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	380	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	231	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NR	NR	ug/L	LAB	2001. Sappington, L.C., F.L. Mayer, F.J. Dwyer, D.R. Buckler, J.R. Jones, and M.R. Ellersieck. Contaminant Sensitivity of Threatened and Endangered Fishes Compared to Standard Surrogate Species. Environ. Toxicol. Chem.20(12): 2869-2876.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	314	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NR	NR	ug/L	LAB	1995. Dwyer, F.J., L.C. Sappington, D.R. Buckler, and S.B. Jones. Use of Surrogate Species in Assessing Contaminant Risk to Endangered and Threatened Fishes. EPA/600/R-96/029, U.S.EPA, Washington, DC: 78 p..
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	331	NA	NR	ug/L	LAB	1996. Buhl, K.J., and S.J. Hamilton. Toxicity of Inorganic Contaminants, Individually and in Environmental Mixtures, to Three Endangered Fishes (Colorado Squawfish, Bonytail, and Razorback Sucker). Arch. Environ. Contam. Toxicol.30(1): 84-92.
Sulfuric acid copper(2+) salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	404	NA	NR	ug/L	LAB	1996. Buhl, K.J., and S.J. Hamilton. Toxicity of Inorganic Contaminants, Individually and in Environmental Mixtures, to Three Endangered Fishes (Colorado Squawfish, Bonytail, and Razorback Sucker). Arch. Environ. Contam. Toxicol.30(1): 84-92.
Copper	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Copper	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Copper	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Copper	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Sulfuric acid copper(2+) salt (1:1)	Rio Grande Silvery Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	379	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rio Grande Silvery Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	262	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Sulfuric acid copper(2+) salt (1:1)	Rio Grande Silvery Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Sulfuric acid copper(2+) salt (1:1)	Rio Grande Silvery Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	2002. Buhl, K.J.. The Relative Toxicity of Waterborne Inorganic Contaminants to the Rio Grande Silvery Minnow (Hybognathus amarus) and Fathead Minnow (Pimephales promelas) in a Water Quality Simulating that in the Rio Grande, New Mexico. Final Rep.to U.S.Fish and Wildl.Serv., Study No.2F33-9620003, U.S.Geol.Surv., Columbia Environ.Res.Ctr., Yankton Field Res.Stn., Yankton, SD: 75 p..
Sulfuric acid copper(2+) salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	1210	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	970	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	880	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	590	NR	NR	ug/L	LAB	2006. Paris-Palacios, S., and S. Biagianti-Risbourg. Hepatocyte Nuclear Structure and Subcellular Distribution of Copper in Zebrafish Brachydanio rerio and Roach Rutilus rutilus (Teleostei, Cyprinidae) Exposed to Copper Sulphate. Aquat. Toxicol.77(3): 306-313.
Sulfuric acid copper(2+) salt (1:1)	Roach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1200	NA	NR	ug/L	LAB	1984. Van Hoof, F., and J.P. Nauwelaers. Distribution of Nickel in the Roach (Rutilus rutilus L.) After Exposure to Lethal and Sublethal Concentrations. Chemosphere13(9): 1053-1058.
Copper	Rohu	Fish	Fresh	Mortality	LC50	Whole Organism	T	234		NC	ug/L	LAB	2006. Shukla, V., M. Dhankhar, and K.V. Sastry. Heavy Metal Toxicity on Labeo rohita. J. Ecotoxicol. Environ. Monit.16(3): 247-250.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	560		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	50000	NR	NR	ug/L	LAB	2009. Som, M., N. Kundu, S. Bhattacharyya, and S. Homechaudhuri. Evaluation of Hemopoietic Responses in Labeo rohita Hamilton Following Acute Copper Toxicity. Toxicol. Environ. Chem.91(1): 87-98.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	776.7	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	8	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	800.5	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	820	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	715.6	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	720	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	765.8	NA	NR	ug/L	LAB	1992. Pande, R., and D.N. Saksena. The Toxicity of Copper Sulphate to the Fingerlings of Labeo rohita (Hamilton). Bull. Environ. Sci.10: 23-27.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	25500*	NA	NR	ug/L	LAB	1980. Deshmukh, S.S., and V.B. Marathe. Size Related Toxicity of Copper and Mercury to Lebistes reticulatus (Peter), Labeo rohita (Ham.) and Cyprinus carpio Linn. Indian J. Exp. Biol.18: 421-423.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	86600*	NA	NR	ug/L	LAB	1980. Deshmukh, S.S., and V.B. Marathe. Size Related Toxicity of Copper and Mercury to Lebistes reticulatus (Peter), Labeo rohita (Ham.) and Cyprinus carpio Linn. Indian J. Exp. Biol.18: 421-423.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LOEL	Not Reported	T	560		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	LOEL	Not Reported	T	560		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	NOEL	Not Reported	T	560		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	NOEL	Not Reported	T	560		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Copper	Rohu	Fish	Fresh	Mortality	NR-LETH	Whole Organism	T	500		NC	ug/L	LAB	2006. Shukla, V., M. Dhankhar, and K.V. Sastry. Heavy Metal Toxicity on Labeo rohita. J. Ecotoxicol. Environ. Monit.16(3): 247-250.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	560		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	560		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	560		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Rohu	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	560		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Copper	Rohu	Fish	Fresh	Mortality	NR-ZERO	Whole Organism	T	100		NC	ug/L	LAB	2006. Shukla, V., M. Dhankhar, and K.V. Sastry. Heavy Metal Toxicity on Labeo rohita. J. Ecotoxicol. Environ. Monit.16(3): 247-250.
Sulfuric acid copper(2+) salt (1:1)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	180*	NA	NR	ug/L	LAB	1980. Pant, S.C., S. Kumar, and S.S. Khanna. Toxicity of Copper Sulphate and Zinc Sulphate to Fresh Water Teleost Puntius conchonius (Ham.) in Hard Water. Comp. Physiol. Ecol.5(3): 146-149.
Sulfuric acid copper(2+) salt (1:1)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	164*	NA	NR	ug/L	LAB	1980. Pant, S.C., S. Kumar, and S.S. Khanna. Toxicity of Copper Sulphate and Zinc Sulphate to Fresh Water Teleost Puntius conchonius (Ham.) in Hard Water. Comp. Physiol. Ecol.5(3): 146-149.
Sulfuric acid copper(2+) salt (1:1)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	145*	NA	NR	ug/L	LAB	1980. Pant, S.C., S. Kumar, and S.S. Khanna. Toxicity of Copper Sulphate and Zinc Sulphate to Fresh Water Teleost Puntius conchonius (Ham.) in Hard Water. Comp. Physiol. Ecol.5(3): 146-149.
Sulfuric acid copper(2+) salt (1:1)	Rudd	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250		NC	ug/L	LAB	1981. Van Hoof, F., and M. Van San. Analysis of Copper, Zinc, Cadmium and Chromium in Fish Tissues. A Tool for Detecting Metal Caused Fish Kills. Chemosphere10(10): 1127-1135.
Copper chloride (CuCl2)	Sea Lamprey	Fish	Fresh	Mortality	LOEL	Not Reported	T	0.1	NR	NR	%	LAB	2004. Ciereszko, A., I. Babiak, and K. Dabrowski. Efficacy of Animal Anti-Fertility Compounds Against Sea Lamprey (Petromyzon marinus) Spermatozoa. Theriogenology61(6): 1039-1050.
Copper chloride (CuCl2)	Sea Lamprey	Fish	Fresh	Reproduction	LOEL	Not Reported	T	0.1	NR	NR	%	LAB	2004. Ciereszko, A., I. Babiak, and K. Dabrowski. Efficacy of Animal Anti-Fertility Compounds Against Sea Lamprey (Petromyzon marinus) Spermatozoa. Theriogenology61(6): 1039-1050.
Copper chloride (CuCl2)	Sea Lamprey	Fish	Fresh	Reproduction	LOEL	Sperm	T	0.25	NR	NR	%	LAB	2004. Ciereszko, A., I. Babiak, and K. Dabrowski. Efficacy of Animal Anti-Fertility Compounds Against Sea Lamprey (Petromyzon marinus) Spermatozoa. Theriogenology61(6): 1039-1050.
Sulfuric acid copper(2+) salt (1:1)	Sheepshead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	630	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Shortfin Molly	Fish	Fresh	Mortality	LC50	Not Reported	T	565.3*	NA	NR	ug/L	LAB	1973. Sun, L.T., and M.L. Gorman. The Toxicity to Fish of Herbicides Recommended for Weed Control in the Rewa. Fiji Agric. J.35(1): 31-33.
Sulfuric acid copper(2+) salt (1:1)	Shortfin Molly	Fish	Fresh	Mortality	LC50*	Not Reported	T	5000	NA	NR	ug/L	LAB	1978. Morrison, R.J.. The Toxicity to Fish of Diaquat-Copper Sulphate Mixtures. Fiji Agric. J.40(2): 105.
Sulfuric acid copper(2+) salt (1:1)	Shortfin Molly	Fish	Fresh	Mortality	LC50*	Not Reported	T	2000	NA	NR	ug/L	LAB	1978. Morrison, R.J.. The Toxicity to Fish of Diaquat-Copper Sulphate Mixtures. Fiji Agric. J.40(2): 105.
Sulfuric acid copper(2+) salt (1:1)	Shortfin Molly	Fish	Fresh	Mortality	LC50*	Not Reported	T	200	NA	NR	ug/L	LAB	1978. Morrison, R.J.. The Toxicity to Fish of Diaquat-Copper Sulphate Mixtures. Fiji Agric. J.40(2): 105.
Sulfuric acid copper(2+) salt (1:1)	Shortnose Sturgeon	Fish	Fresh	Mortality	LC50	Not Reported	F	150		NC	ug/L	LAB	2000. Dwyer, F.J., D.K. Hardesty, C.G. Ingersoll, J.L. Kunz, and D.W. Whites. Assessing Contaminant Sensitivity of American Shad, Atlantic Sturgeon and Shortnose Strugeon, Final Report - February 2000. Final Rep., U.S.Geol.Surv., Columbia Environ.Res.Ctr., Columbia, MO: 30 p..

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Shortnose Sturgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Shovelnose Sturgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	540	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Shovelnose Sturgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	380	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Shovelnose Sturgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Shovelnose Sturgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Shovelnose Sturgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Copper	Silver Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	2170		NC	ug/L	LAB	2001. Shariff, M., P.A.H.L. Jayawardena, F.M. Yusoff, and R. Subasinghe. Immunological Parameters of Javanese Carp Puntius gonionotus (Bleeker) Exposed to Copper and Challenged with Aeromonas hydrophila. Fish Shellfish Immunol.11(4): 281-291.
Copper	Silver Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	910		NC	ug/L	LAB	2001. Shariff, M., P.A.H.L. Jayawardena, F.M. Yusoff, and R. Subasinghe. Immunological Parameters of Javanese Carp Puntius gonionotus (Bleeker) Exposed to Copper and Challenged with Aeromonas hydrophila. Fish Shellfish Immunol.11(4): 281-291.
Copper	Silver Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	570		NC	ug/L	LAB	2001. Shariff, M., P.A.H.L. Jayawardena, F.M. Yusoff, and R. Subasinghe. Immunological Parameters of Javanese Carp Puntius gonionotus (Bleeker) Exposed to Copper and Challenged with Aeromonas hydrophila. Fish Shellfish Immunol.11(4): 281-291.
Copper	Silver Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	530		NC	ug/L	LAB	2001. Shariff, M., P.A.H.L. Jayawardena, F.M. Yusoff, and R. Subasinghe. Immunological Parameters of Javanese Carp Puntius gonionotus (Bleeker) Exposed to Copper and Challenged with Aeromonas hydrophila. Fish Shellfish Immunol.11(4): 281-291.
Copper	Silver Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	420		NR	ug/L	LAB	2001. Shariff, M., P.A.H.L. Jayawardena, F.M. Yusoff, and R. Subasinghe. Immunological Parameters of Javanese Carp Puntius gonionotus (Bleeker) Exposed to Copper and Challenged with Aeromonas hydrophila. Fish Shellfish Immunol.11(4): 281-291.
Sulfuric acid copper(2+) salt (1:1)	Silver Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	166.18	NA	NR	ug/L	LAB	1987. Jangchudjai, C., E.S. Upatham, M. Duangsawasdi, and P. Kiravanich. Acute Toxicity of the Synergism of Surfactant (LAS) and Copper on the Freshwater Fish, Puntius gonionotus, Bleeker. J. Sci. Soc. Thail.13: 159-167.
Sulfuric acid copper(2+) salt (1:1)	Silver Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	109.05	NA	NR	ug/L	LAB	1987. Jangchudjai, C., E.S. Upatham, M. Duangsawasdi, and P. Kiravanich. Acute Toxicity of the Synergism of Surfactant (LAS) and Copper on the Freshwater Fish, Puntius gonionotus, Bleeker. J. Sci. Soc. Thail.13: 159-167.
Sulfuric acid copper(2+) salt (1:1)	Silver Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	94.82	NA	NR	ug/L	LAB	1987. Jangchudjai, C., E.S. Upatham, M. Duangsawasdi, and P. Kiravanich. Acute Toxicity of the Synergism of Surfactant (LAS) and Copper on the Freshwater Fish, Puntius gonionotus, Bleeker. J. Sci. Soc. Thail.13: 159-167.
Sulfuric acid copper(2+) salt (1:1)	Silver Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	91.96	NA	NR	ug/L	LAB	1987. Jangchudjai, C., E.S. Upatham, M. Duangsawasdi, and P. Kiravanich. Acute Toxicity of the Synergism of Surfactant (LAS) and Copper on the Freshwater Fish, Puntius gonionotus, Bleeker. J. Sci. Soc. Thail.13: 159-167.
Sulfuric acid copper(2+) salt (1:1)	Silver Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.
Sulfuric acid copper(2+) salt (1:1)	Silver Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1984. Skidmore, J.F., and I.C. Firth. Prediction of the Toxicity of Copper to Australian Freshwater Animals. In: D.Pascoe and R.W.Edwards (Eds.), Freshwater Biological Monitoring.Proc.Specialized Conf.Int.Assoc.on Water Pollution Research and Control, Pergamon Press, New York, NY: 93-100.
Sulfuric acid copper(2+) salt (1:1)	Silver Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1984. Skidmore, J.F., and I.C. Firth. Prediction of the Toxicity of Copper to Australian Freshwater Animals. In: D.Pascoe and R.W.Edwards (Eds.), Freshwater Biological Monitoring.Proc.Specialized Conf.Int.Assoc.on Water Pollution Research and Control, Pergamon Press, New York, NY: 93-100.
Sulfuric acid copper(2+) salt (1:1)	Silver Perch	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Rowland, S.J., C. Mifsud, M. Nixon, P. Read, and M. Landos. Use of Formalin and Copper to Control Ichthyophthiriosis in the Australian Freshwater Fish Silver Perch (Bidyanus bidyanus Mitchell). Aquac.Res.40(1): 44-54.
Sulfuric acid copper(2+) salt (1:1)	Silver Perch	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	200	NR	NR	ug/L	LAB	2008. Rowland, S.J., C. Mifsud, M. Nixon, P. Read, and M. Landos. Use of Formalin and Copper to Control Ichthyophthiriosis in the Australian Freshwater Fish Silver Perch (Bidyanus bidyanus Mitchell). Aquac.Res.40(1): 44-54.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Silverside	Fish	Fresh	Mortality	LD50	Not Reported	T	370	NA	NR	ug/L	LAB	1991. Trucco, R.G., J. Inda, and M.L. Fernandez. Acute Toxicity and Accumulation of Copper, Manganese and Molybdenum by Basilichthys australis. In: P.Chapman, F.Bishay, E.Power, K.Hall, L.Harding, D.McLeay, M.Nassichuk and W.Knapp (Eds.), Proc.17th Annual Aquatic Toxicity Workshop, Nov.5-7, 1990, Vol.2, Vancouver, B.C., Can.Tech.Rep.Fish Aquat.Sci.No.1774: 1132.
Sulfuric acid copper(2+) salt (1:1)	Smooth-Breasted Snakefish	Fish	NR	Growth	NR		T	100	NA	NR	ug/L	LAB	1980. Marathe, V.B., and S.S. Deshmukh. Effect of Copper Contaminated Food on the Growth (Biomass) of Channa gachua (Ham.). Proc. Indian Acad. Sci. Sect. B89(4): 403-406.
Copper	Snake-Head Catfish	Fish	Fresh	Growth	NR		T	5000	NA	NR	ug/L	NR	1987. Jana, S.R., and N. Bandyopadhyaya. Effect of Heavy Metals on Some Biochemical Parameters in the Freshwater Fish Channa punctatus. Aquat. Sci. Fish. Abstr.18(4): 5486-1Q18.
Copper	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	372	NR	NR	ug/L	NR	1999. Gupta, A.K.. Short-Term Toxicity of Copper to Channa punctatus (Bloch). J. Environ. Biol.20(3): 227-229.
Copper	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	477	NR	NR	ug/L	NR	1999. Gupta, A.K.. Short-Term Toxicity of Copper to Channa punctatus (Bloch). J. Environ. Biol.20(3): 227-229.
Copper	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	365	NR	NR	ug/L	NR	1999. Gupta, A.K.. Short-Term Toxicity of Copper to Channa punctatus (Bloch). J. Environ. Biol.20(3): 227-229.
Copper	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	432	NR	NR	ug/L	NR	1999. Gupta, A.K.. Short-Term Toxicity of Copper to Channa punctatus (Bloch). J. Environ. Biol.20(3): 227-229.
Copper	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	342	NR	NR	ug/L	NR	1999. Gupta, A.K.. Short-Term Toxicity of Copper to Channa punctatus (Bloch). J. Environ. Biol.20(3): 227-229.
Copper	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	395	NR	NR	ug/L	NR	1999. Gupta, A.K.. Short-Term Toxicity of Copper to Channa punctatus (Bloch). J. Environ. Biol.20(3): 227-229.
Copper	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	339	NR	NR	ug/L	NR	1999. Gupta, A.K.. Short-Term Toxicity of Copper to Channa punctatus (Bloch). J. Environ. Biol.20(3): 227-229.
Copper	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	387	NR	NR	ug/L	NR	1999. Gupta, A.K.. Short-Term Toxicity of Copper to Channa punctatus (Bloch). J. Environ. Biol.20(3): 227-229.
Copper	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	12400	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Copper	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	12400	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Copper	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	11270	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Copper	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	9550	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Copper	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	12440	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Copper	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	5192	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3500	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1658	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1062	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	900	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	11780		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1997. Sastry, K.V., S. Sachdeva, and P. Rathee. Chronic Toxic Effects of Cadmium and Copper, and Their Combination on Some Enzymological and Biochemical Parameters in Channa punctatus. J. Environ. Biol.18(3): 291-303.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	2130	NA	NR	ug/L	NR	1990. Singh, A., and J.S.D. Munshi. The Effects of Heavy Metals on Gills of Fishes: A Morphometric Study. J. Freshw. Biol.2(1): 69-72.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	28000*	NA	NR	ug/L	LAB	1974. Mukherjee, S., and S. Bhattacharya. Effects of Some Industrial Pollutants on Fish Brain Cholinesterase Activity. Environ. Physiol. Biochem.4: 226-231.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LOEL	Not Reported	T	11780		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LOEL	Not Reported	T	11780		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LOEL	Not Reported	T	11780		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LOEL	Not Reported	T	11780		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Copper	Snake-Head Catfish	Fish	Fresh	Mortality	MATC	Not Reported	T	327	NR	NR	ug/L	NR	1999. Gupta, A.K.. Short-Term Toxicity of Copper to Channa punctatus (Bloch). J. Environ. Biol.20(3): 227-229.
Copper	Snake-Head Catfish	Fish	Fresh	Mortality	MATC	Not Reported	T	327	NR	NR	ug/L	NR	1999. Gupta, A.K.. Short-Term Toxicity of Copper to Channa punctatus (Bloch). J. Environ. Biol.20(3): 227-229.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	NOEL	Not Reported	T	11780		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	11780		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	11780		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	11780		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	11780		NC	ug/L	LAB	2003. Adhikari, S.. Effect of Calcium and Magnesium Hardness on Acute Copper Toxicity to Indian Major Carp, Labeo rohita (Hamilton) and Catfish, Channa punctatus (Bloch). Aquac.Res.34(12): 975-980.
Sulfuric acid copper(2+) salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NR	NR	ug/L	LAB	1994. Pandey, A.K., and K. Pandey. Biochemical Estimation of Lipid in Liver and Muscle of Some Fresh Water Fishes. Environ. Ecol.12(4): 880-883.
Copper chloride (CuCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	103	NA	NR	ug/L	LAB	1978. Davis, J.C., and I.G. Shand. Acute and Sublethal Copper Sensitivity, Growth and Saltwater Survival in Young Babine Lake Sockeye Salmon. Can.Fish.Mar.Serv., Tech.Rep.No.847: 1-55.
Copper chloride (CuCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1978. Davis, J.C., and I.G. Shand. Acute and Sublethal Copper Sensitivity, Growth and Saltwater Survival in Young Babine Lake Sockeye Salmon. Can.Fish.Mar.Serv., Tech.Rep.No.847: 1-55.
Copper chloride (CuCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	214	NA	NR	ug/L	LAB	1978. Davis, J.C., and I.G. Shand. Acute and Sublethal Copper Sensitivity, Growth and Saltwater Survival in Young Babine Lake Sockeye Salmon. Can.Fish.Mar.Serv., Tech.Rep.No.847: 1-55.
Copper chloride (CuCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1978. Davis, J.C., and I.G. Shand. Acute and Sublethal Copper Sensitivity, Growth and Saltwater Survival in Young Babine Lake Sockeye Salmon. Can.Fish.Mar.Serv., Tech.Rep.No.847: 1-55.
Copper chloride (CuCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1978. Davis, J.C., and I.G. Shand. Acute and Sublethal Copper Sensitivity, Growth and Saltwater Survival in Young Babine Lake Sockeye Salmon. Can.Fish.Mar.Serv., Tech.Rep.No.847: 1-55.
Copper chloride (CuCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1978. Davis, J.C., and I.G. Shand. Acute and Sublethal Copper Sensitivity, Growth and Saltwater Survival in Young Babine Lake Sockeye Salmon. Can.Fish.Mar.Serv., Tech.Rep.No.847: 1-55.
Copper chloride (CuCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	83	NA	NR	ug/L	LAB	1978. Davis, J.C., and I.G. Shand. Acute and Sublethal Copper Sensitivity, Growth and Saltwater Survival in Young Babine Lake Sockeye Salmon. Can.Fish.Mar.Serv., Tech.Rep.No.847: 1-55.
Sulfuric acid copper(2+) salt (1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid copper(2+) salt (1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid copper(2+) salt (1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid copper(2+) salt (1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid copper(2+) salt (1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid copper(2+) salt (1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid copper(2+) salt (1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid copper(2+) salt (1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid copper(2+) salt (1:1)	Sockeye Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	D	NR	ug/L	FIELDN	1982. Wan, M.T.K., B.C. Pearce, and J. Truscott. Impact of Copper Sulphate Molluscicide Treatments on Cultus Lake, B.C.. Reg.Prog.Rep.No.82-08, Environ.Serv.Branch, Environ.Prot.Serv., Pacific and Yukon Region, Canada: 35 p..
Sulfuric acid copper(2+) salt (1:1)	Sockeye Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	635	NA	NR	ug/L	LAB	1975. Donaldson, E.M., and H.M. Dye. Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus nerka) Exposed to Low Concentrations of Copper. J. Fish. Res. Board Can.32(4): 533-539.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Growth	LOEC	Not Reported	T	16	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	1.6	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC5	Not Reported	T	110	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC5	Not Reported	T	60	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC5	Not Reported	T	40	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC5	Not Reported	T	30	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	449	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC95	Not Reported	T	1700	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC95	Not Reported	T	1530	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC95	Not Reported	T	970	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC95	Not Reported	T	710	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	IC10	Not Reported	T	23	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	IC10	Not Reported	T	23	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	IC25	Not Reported	T	14300	NR	NR	ug/L	LAB	2005. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, T. Augspurger, T.J. Canfield, D.R. Mount, and F.L.. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part III. Effluent Toxicity Tests. Arch. Environ. Contam. Toxicol.48(2): 174-183.
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	IC25	Not Reported	T	65000	NR	NR	ug/L	LAB	2005. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, T. Augspurger, T.J. Canfield, D.R. Mount, and F.L.. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part III. Effluent Toxicity Tests. Arch. Environ. Contam. Toxicol.48(2): 174-183.
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	IC25	Not Reported	T	40	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	IC25	Not Reported	T	40	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	LOEC	Not Reported	T	23	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	LOEC	Not Reported	T	22.7	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	LOEC	Not Reported	T	22.7	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	MATC	Not Reported	T	16	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	NOEC	Not Reported	T	11	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	NOEC	Not Reported	T	11.1	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Growth	NOEC	Not Reported	T	11.1	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Mortality	IC10	Not Reported	T	32	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Mortality	IC10	Not Reported	T	32	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Mortality	LOEC	Not Reported	T	42	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Mortality	LOEC	Not Reported	T	42.1	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Mortality	MATC	Not Reported	T	31	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Mortality	NOEC	Not Reported	T	23	NR	NR	ug/L	LAB	2005. Besser, J.M., N. Wang, F.J. Dwyer, F.L.,Jr. Mayer, and C.G. Ingersoll. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part II. Chronic Toxicity of Copper and Pentachlorophenol to Two Endangered Species and Two Surrogate Species. Arch. Environ. Contam. Toxicol.48(2): 155-165.
Sulfuric acid copper(2+) salt (1:1)	Spotfin Chub	Fish	Fresh	Mortality	NOEC	Not Reported	T	22.7	NR	NR	ug/L	LAB	2001. Besser, J.M., F.J. Dwyer, C.G. Ingersoll, and N. Wang. Early Life-Stage Toxicity of Copper to Endangered and Surrogate Fish Species. EPA/600/R-01/051, U.S.EPA, Washington, DC: 22 p..
Copper chloride (CuCl2)	Spotted Barbel	Fish	Fresh	Mortality	LOEL	Not Reported	T	NR	NR	NR	uM	LAB	2008. Cho, Y.S., S.Y. Lee, K.Y. Kim, I.C. Bang, D.S. Kim, and Y.K. Nam. Gene Structure and Expression of Metallothionein During Metal Exposures in Hemibarbus mylodon. Ecotoxicol. Environ. Saf.71(1): 125-137.
Sulfuric acid copper(2+) salt (1:1)	Stone Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1976. Solbe, J.F.de L.G., and V.A. Cooper. Studies on the Toxicity of Copper Sulphate to Stone Loach Noemacheilus barbatulus (L.) in Hard Water. Water Res.10(6): 523-527.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Growth	LOEC	Whole Organism	T	53	NR	NR	ug/L	LAB	2006. Bielmyer, G.K., J. Tomasso, and S.J. Klaine. Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater; ERRATUM to "Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater". Arch. Environ. Contam. Toxicol.50(3): 531-538.
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Growth	NOEC	Not Reported	T	900		NC	ug/L	LAB	2007. Geist, J., I. Werner, K.J. Eder, and C.M. Leutenegger. Comparisons of Tissue-Specific Transcription of Stress Response Genes with Whole Animal Endpoints of Adverse Effect in Striped Bass (Morone saxatilis) Following Treatment with Copper and Esfenvalerate. Aquat. Toxicol.85(1): 28-39.
Copper	Striped Bass	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Growth	NR	Whole Organism	T	24	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Growth	NR	Whole Organism	T	35	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Growth	NR	Whole Organism	T	36	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Growth	NR	Whole Organism	T	74	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Growth	NR	Whole Organism	T	53	NR	NR	ug/L	LAB	2006. Bielmyer, G.K., J. Tomasso, and S.J. Klaine. Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater; ERRATUM to "Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater". Arch. Environ. Contam. Toxicol.50(3): 531-538.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Growth	NR	Whole Organism	T	53	NR	NR	ug/L	LAB	2006. Bielmyer, G.K., J. Tomasso, and S.J. Klaine. Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater; ERRATUM to "Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater". Arch. Environ. Contam. Toxicol.50(3): 531-538.
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	EC25	Not Reported	D	262		NC	ug/L	LAB	2007. Geist, J., I. Werner, K.J. Eder, and C.M. Leutenegger. Comparisons of Tissue-Specific Transcription of Stress Response Genes with Whole Animal Endpoints of Adverse Effect in Striped Bass (Morone saxatilis) Following Treatment with Copper and Esfenvalerate. Aquat. Toxicol.85(1): 28-39.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC0	Not Reported	T	100	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC0	Not Reported	T	250	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC0	Not Reported	T	100	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC0	Not Reported	T	100	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC0	Not Reported	T	100	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC0	Not Reported	T	100	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC0	Not Reported	T	100	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC0	Not Reported	T	50	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC100	Not Reported	T	1000	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC100	Not Reported	T	500	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC100	Not Reported	T	500	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC100	Not Reported	T	750	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC100	Not Reported	T	250	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC100	Not Reported	T	750	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC100	Not Reported	T	250	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC100	Not Reported	T	500	NR	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC16	Not Reported	T	600*	NA	NR	ug/L	LAB	1969. Wellborn, T.L.,Jr.. The Toxicity of Nine Therapeutic and Herbicidal Compounds to Striped Bass. Prog. Fish-Cult.31(1): 27-32.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC16	Not Reported	T	35.2*	NA	NR	ug/L	LAB	1969. Wellborn, T.L.,Jr.. The Toxicity of Nine Therapeutic and Herbicidal Compounds to Striped Bass. Prog. Fish-Cult.31(1): 27-32.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC16	Not Reported	T	180*	NA	NR	ug/L	LAB	1969. Wellborn, T.L.,Jr.. The Toxicity of Nine Therapeutic and Herbicidal Compounds to Striped Bass. Prog. Fish-Cult.31(1): 27-32.
Copper	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Copper	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	420	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Copper	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Copper	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	6600	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	24	NA	NR	ug/L	LAB	1988. Wright, D.A.. Dose-Related Toxicity of Copper and Cadmium in Striped Bass Larvae from the Chesapeake Bay: Field Considerations. Water Sci. Technol.20(6-7): 39-48.
Copper	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	740	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Copper	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	850	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	50		NC	ug/L	LAB	1969. Hughes, J.S.. Toxicity of Some Chemicals to Striped Bass (Roccus saxatilis). Proc. Southeast. Assoc. Game Fish Comm.22: 230-234.
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	50		NC	ug/L	LAB	1969. Hughes, J.S.. Toxicity of Some Chemicals to Striped Bass (Roccus saxatilis). Proc. Southeast. Assoc. Game Fish Comm.22: 230-234.
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	262		NC	ug/L	LAB	2007. Geist, J., I. Werner, K.J. Eder, and C.M. Leutenegger. Comparisons of Tissue-Specific Transcription of Stress Response Genes with Whole Animal Endpoints of Adverse Effect in Striped Bass (Morone saxatilis) Following Treatment with Copper and Esfenvalerate. Aquat. Toxicol.85(1): 28-39.
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	80	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	F	4090	NA	NR	ug/L	LAB	1993. Bills, T.D., L.L. Marking, and G.E. Howe. Sensitivity of Juvenile Striped Bass to Chemicals Used in Aquaculture. Resour.Publ.192, Fish Wildl.Serv., U.S.D.I., Washington, DC: 11 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	620	NA	NR	ug/L	LAB	1969. Wellborn, T.L.,Jr.. The Toxicity of Nine Therapeutic and Herbicidal Compounds to Striped Bass. Prog. Fish-Cult.31(1): 27-32.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	F	750	NA	NR	ug/L	LAB	1993. Bills, T.D., L.L. Marking, and G.E. Howe. Sensitivity of Juvenile Striped Bass to Chemicals Used in Aquaculture. Resour.Publ.192, Fish Wildl.Serv., U.S.D.I., Washington, DC: 11 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	460*	NA	NR	ug/L	LAB	1969. Wellborn, T.L.,Jr.. The Toxicity of Nine Therapeutic and Herbicidal Compounds to Striped Bass. Prog. Fish-Cult.31(1): 27-32.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	94	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	83	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	92	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	F	230	NA	NR	ug/L	LAB	1993. Bills, T.D., L.L. Marking, and G.E. Howe. Sensitivity of Juvenile Striped Bass to Chemicals Used in Aquaculture. Resour.Publ.192, Fish Wildl.Serv., U.S.D.I., Washington, DC: 11 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	248*	NA	NR	ug/L	LAB	1969. Wellborn, T.L.,Jr.. The Toxicity of Nine Therapeutic and Herbicidal Compounds to Striped Bass. Prog. Fish-Cult.31(1): 27-32.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	36	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	94	NR	NR	ug/L	LAB	2006. Bielmyer, G.K., J. Tomasso, and S.J. Klaine. Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater; ERRATUM to "Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater". Arch. Environ. Contam. Toxicol.50(3): 531-538.
Copper oxide (CuO)	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	310	NA	NR	ug/L	LAB	1972. O'Rear, C.W.J.. The Toxicity of Zinc and Copper to Striped Bass Eggs and Fry with Methods for Providing Confidence Limits. Proc. Southeast. Assoc. Game Fish Comm.26: 484-489.
Copper oxide (CuO)	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	420	NA	NR	ug/L	LAB	1972. O'Rear, C.W.J.. The Toxicity of Zinc and Copper to Striped Bass Eggs and Fry with Methods for Providing Confidence Limits. Proc. Southeast. Assoc. Game Fish Comm.26: 484-489.
Copper oxide (CuO)	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	740	NA	NR	ug/L	LAB	1972. O'Rear, C.W.J.. The Toxicity of Zinc and Copper to Striped Bass Eggs and Fry with Methods for Providing Confidence Limits. Proc. Southeast. Assoc. Game Fish Comm.26: 484-489.
Copper oxide (CuO)	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	850	NA	NR	ug/L	LAB	1972. O'Rear, C.W.J.. The Toxicity of Zinc and Copper to Striped Bass Eggs and Fry with Methods for Providing Confidence Limits. Proc. Southeast. Assoc. Game Fish Comm.26: 484-489.
Nitric acid, Copper(2+) salt	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	8300	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nitric acid, Copper(2+) salt	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	6200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nitric acid, Copper(2+) salt	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	4300	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LOEC	Not Reported	T	470		NC	ug/L	LAB	2007. Geist, J., I. Werner, K.J. Eder, and C.M. Leutenegger. Comparisons of Tissue-Specific Transcription of Stress Response Genes with Whole Animal Endpoints of Adverse Effect in Striped Bass (Morone saxatilis) Following Treatment with Copper and Esfenvalerate. Aquat. Toxicol.85(1): 28-39.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	LOEC	Not Reported	T	470		NC	ug/L	LAB	2007. Geist, J., I. Werner, K.J. Eder, and C.M. Leutenegger. Comparisons of Tissue-Specific Transcription of Stress Response Genes with Whole Animal Endpoints of Adverse Effect in Striped Bass (Morone saxatilis) Following Treatment with Copper and Esfenvalerate. Aquat. Toxicol.85(1): 28-39.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	MATC	Not Reported	T	29	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	MATC	Not Reported	T	22	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	NOEC	Not Reported	T	160		NC	ug/L	LAB	2007. Geist, J., I. Werner, K.J. Eder, and C.M. Leutenegger. Comparisons of Tissue-Specific Transcription of Stress Response Genes with Whole Animal Endpoints of Adverse Effect in Striped Bass (Morone saxatilis) Following Treatment with Copper and Esfenvalerate. Aquat. Toxicol.85(1): 28-39.
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	NOEC	Not Reported	T	160		NC	ug/L	LAB	2007. Geist, J., I. Werner, K.J. Eder, and C.M. Leutenegger. Comparisons of Tissue-Specific Transcription of Stress Response Genes with Whole Animal Endpoints of Adverse Effect in Striped Bass (Morone saxatilis) Following Treatment with Copper and Esfenvalerate. Aquat. Toxicol.85(1): 28-39.
Copper	Striped Bass	Fish	Fresh	Mortality	NOEL	Not Reported	T	10	NR	NR	ug/L	LAB	1986. MacFarlane, R.D., G.L. Bullock, and J.J.A. McLaughlin. Effects of Five Metals on Susceptibility of Striped Bass to Flexibacter columnaris. Trans. Am. Fish. Soc.115(2): 227-231.
Copper	Striped Bass	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	NR	Not Reported	T	74	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	NR	Not Reported	T	447	NR	NR	ug/L	LAB	2006. Bielmyer, G.K., J. Tomasso, and S.J. Klaine. Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater; ERRATUM to "Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater". Arch. Environ. Contam. Toxicol.50(3): 531-538.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	NR	Not Reported	T	53	NR	NR	ug/L	LAB	2006. Bielmyer, G.K., J. Tomasso, and S.J. Klaine. Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater; ERRATUM to "Physiological Responses of Hybrid Striped Bass to Aqueous Copper in Freshwater and Saltwater". Arch. Environ. Contam. Toxicol.50(3): 531-538.
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	470		NC	ug/L	LAB	2007. Geist, J., I. Werner, K.J. Eder, and C.M. Leutenegger. Comparisons of Tissue-Specific Transcription of Stress Response Genes with Whole Animal Endpoints of Adverse Effect in Striped Bass (Morone saxatilis) Following Treatment with Copper and Esfenvalerate. Aquat. Toxicol.85(1): 28-39.
Copper	Striped Bass	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	10	NR	NR	ug/L	LAB	1986. MacFarlane, R.D., G.L. Bullock, and J.J.A. McLaughlin. Effects of Five Metals on Susceptibility of Striped Bass to Flexibacter columnaris. Trans. Am. Fish. Soc.115(2): 227-231.
Copper chloride (CuCl2)	Striped Bass	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	42		NC	ug/L	LAB	2007. Geist, J., I. Werner, K.J. Eder, and C.M. Leutenegger. Comparisons of Tissue-Specific Transcription of Stress Response Genes with Whole Animal Endpoints of Adverse Effect in Striped Bass (Morone saxatilis) Following Treatment with Copper and Esfenvalerate. Aquat. Toxicol.85(1): 28-39.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	35	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	24	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Bass	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	19	NA	NR	ug/L	LAB	1991. Fujimura, R., B. Finlayson, and G. Chapman. Evaluation of Acute and Chronic Toxicity Tests with Larval Striped Bass. In: M.A.Mayes and M.G.Barron (Eds.), Aquatic Toxicology and Risk Assessment, Vol.14, ASTM STP 1124, Philadelphia, PA: 193-211.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Growth	LOEC	Not Reported	T	1200	NR	NR	ug/L	LAB	2007. Subathra, S., and R. Karuppasamy. Toxic Effects of Copper on Bioenergetics and Growth Rates in Fingerlings and Adult Age of the Fish, Mystus vittatus (Bloch, 1794). J. Fish. Aquat. Sci.2(4): 285-293.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Growth	LOEC	Not Reported	T	470	NR	NR	ug/L	LAB	2007. Subathra, S., and R. Karuppasamy. Toxic Effects of Copper on Bioenergetics and Growth Rates in Fingerlings and Adult Age of the Fish, Mystus vittatus (Bloch, 1794). J. Fish. Aquat. Sci.2(4): 285-293.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Growth	LOEC	Not Reported	T	1200	NR	NR	ug/L	LAB	2007. Subathra, S., and R. Karuppasamy. Toxic Effects of Copper on Bioenergetics and Growth Rates in Fingerlings and Adult Age of the Fish, Mystus vittatus (Bloch, 1794). J. Fish. Aquat. Sci.2(4): 285-293.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Growth	LOEC	Not Reported	T	470	NR	NR	ug/L	LAB	2007. Subathra, S., and R. Karuppasamy. Toxic Effects of Copper on Bioenergetics and Growth Rates in Fingerlings and Adult Age of the Fish, Mystus vittatus (Bloch, 1794). J. Fish. Aquat. Sci.2(4): 285-293.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Growth	LOEC	Not Reported	T	1200	NR	NR	ug/L	LAB	2007. Subathra, S., and R. Karuppasamy. Toxic Effects of Copper on Bioenergetics and Growth Rates in Fingerlings and Adult Age of the Fish, Mystus vittatus (Bloch, 1794). J. Fish. Aquat. Sci.2(4): 285-293.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Growth	LOEC	Not Reported	T	470	NR	NR	ug/L	LAB	2007. Subathra, S., and R. Karuppasamy. Toxic Effects of Copper on Bioenergetics and Growth Rates in Fingerlings and Adult Age of the Fish, Mystus vittatus (Bloch, 1794). J. Fish. Aquat. Sci.2(4): 285-293.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	850	NR	NR	ug/L	LAB	1992. Pande, R.K., and G.K. Shukla. Study of Acute Toxicity Dose of Herbicide, CuSO4.5H2O; Agrochemical, NPK; and Chemotherapeutics like Formalin and KMnO4 on Mystus vittatus and Colisa fasciatus. Z. Angew. Zool.79(2): 221-241.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NR	NR	ug/L	LAB	1992. Pande, R.K., and G.K. Shukla. Study of Acute Toxicity Dose of Herbicide, CuSO4.5H2O; Agrochemical, NPK; and Chemotherapeutics like Formalin and KMnO4 on Mystus vittatus and Colisa fasciatus. Z. Angew. Zool.79(2): 221-241.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	18620	NR	NR	ug/L	LAB	2007. Subathra, S., and R. Karuppasamy. Toxic Effects of Copper on Bioenergetics and Growth Rates in Fingerlings and Adult Age of the Fish, Mystus vittatus (Bloch, 1794). J. Fish. Aquat. Sci.2(4): 285-293.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	47860	NR	NR	ug/L	LAB	2007. Subathra, S., and R. Karuppasamy. Toxic Effects of Copper on Bioenergetics and Growth Rates in Fingerlings and Adult Age of the Fish, Mystus vittatus (Bloch, 1794). J. Fish. Aquat. Sci.2(4): 285-293.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	1992. Pande, R.K., and G.K. Shukla. Study of Acute Toxicity Dose of Herbicide, CuSO4.5H2O; Agrochemical, NPK; and Chemotherapeutics like Formalin and KMnO4 on Mystus vittatus and Colisa fasciatus. Z. Angew. Zool.79(2): 221-241.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	700	NR	NR	ug/L	LAB	1994. Pande, R.K., and G.K. Shukla. Acute Toxicity and Efficacy of Herbicide CuSO4-5H2O, Used in Aquaculture, when Applied to Waters of Different Quality on Certain Fresh Water Teleosts. Z. Angew. Zool.80(3): 297-311.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1600	NR	NR	ug/L	LAB	1992. Pande, R.K., and G.K. Shukla. Study of Acute Toxicity Dose of Herbicide, CuSO4.5H2O; Agrochemical, NPK; and Chemotherapeutics like Formalin and KMnO4 on Mystus vittatus and Colisa fasciatus. Z. Angew. Zool.79(2): 221-241.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4000	NR	NR	ug/L	LAB	1994. Pandey, A.K., and K. Pandey. Biochemical Estimation of Lipid in Liver and Muscle of Some Fresh Water Fishes. Environ. Ecol.12(4): 880-883.
Sulfuric acid copper(2+) salt (1:1)	Striped Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	500	NR	NR	ug/L	LAB	1994. Pandey, A.K., and K. Pandey. Biochemical Estimation of Lipid in Liver and Muscle of Some Fresh Water Fishes. Environ. Ecol.12(4): 880-883.
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	D	2800	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	5100	D	630	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	D	980	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	830	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	9400	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	5100	D	630	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	D	980	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	790	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	D	1200	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	D	1100	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	2700	D	590	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	4500	D	610	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	D	810	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	760	NA	NR	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Striped Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	D	720	ug/L	LAB	1976. Geckler, J.R., W.B. Horning, T.M. Neiheisel, Q.H. Pickering, E.L. Robinson, and C.E. Stephan. Validity of Laboratory Tests for Predicting Copper Toxicity in Streams. EPA-600/3-76-116, U.S.EPA, Duluth, MN: 208 p..
Sulfuric acid copper(2+) salt (1:1)	Sunshine Bass	Fish	Fresh	Growth	NOEC	Not Reported	T	571	NR	NR	ug/g dry f	LAB	2005. Bielmyer, G.K., D. Gatlin, J.J. Isely, J. Tomasso, and S.J. Klaine. Responses of Hybrid Striped Bass to Waterborne and Dietary Copper in Freshwater and Saltwater. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.140(1): 131-137.
Sulfuric acid copper(2+) salt (1:1)	Sunshine Bass	Fish	Fresh	Growth	NOEC	Not Reported	T	571	NR	NR	ug/g dry f	LAB	2005. Bielmyer, G.K., D. Gatlin, J.J. Isely, J. Tomasso, and S.J. Klaine. Responses of Hybrid Striped Bass to Waterborne and Dietary Copper in Freshwater and Saltwater. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.140(1): 131-137.
Sulfuric acid copper(2+) salt (1:1)	Sunshine Bass	Fish	Fresh	Growth	NOEC	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Bielmyer, G.K., D. Gatlin, J.J. Isely, J. Tomasso, and S.J. Klaine. Responses of Hybrid Striped Bass to Waterborne and Dietary Copper in Freshwater and Saltwater. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.140(1): 131-137.
Sulfuric acid copper(2+) salt (1:1)	Sunshine Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	850	NR	NR	ug/L	LAB	2006. Straus, D.L.. Species Sensitivity to Copper: Acute Toxicity to Channel Catfish, Ictalurus punctatus, and Sunshine Bass, Morone chrysops x M. saxatilis. J. Appl. Aquacult.18(1): 89-99.
Sulfuric acid copper(2+) salt (1:1)	Sunshine Bass	Fish	Fresh	Mortality	LOEC	Not Reported	T	410	NR	NR	ug/L	LAB	2006. Straus, D.L.. Species Sensitivity to Copper: Acute Toxicity to Channel Catfish, Ictalurus punctatus, and Sunshine Bass, Morone chrysops x M. saxatilis. J. Appl. Aquacult.18(1): 89-99.
Sulfuric acid copper(2+) salt (1:1)	Sunshine Bass	Fish	Fresh	Mortality	LOEC	Not Reported	T	2000	NR	NR	ug/L	LAB	2008. Mitchell, A.J., A. Darwish, and A. Fuller. Comparison of Tank Treatments with Copper Sulfate and Potassium Permanganate for Sunshine Bass with Ichthyobodosis. J. Aquat. Anim. Health20(4): 202-206.
Sulfuric acid copper(2+) salt (1:1)	Sunshine Bass	Fish	Fresh	Mortality	LOEC	Not Reported	T	2000	NR	NR	ug/L	LAB	2008. Mitchell, A.J., A. Darwish, and A. Fuller. Comparison of Tank Treatments with Copper Sulfate and Potassium Permanganate for Sunshine Bass with Ichthyobodosis. J. Aquat. Anim. Health20(4): 202-206.
Sulfuric acid copper(2+) salt (1:1)	Sunshine Bass	Fish	Fresh	Mortality	NOEC	Not Reported	T	230	NR	NR	ug/L	LAB	2006. Straus, D.L.. Species Sensitivity to Copper: Acute Toxicity to Channel Catfish, Ictalurus punctatus, and Sunshine Bass, Morone chrysops x M. saxatilis. J. Appl. Aquacult.18(1): 89-99.
Sulfuric acid copper(2+) salt (1:1)	Sunshine Bass	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NR	NR	ug/L	LAB	2008. Mitchell, A.J., A. Darwish, and A. Fuller. Comparison of Tank Treatments with Copper Sulfate and Potassium Permanganate for Sunshine Bass with Ichthyobodosis. J. Aquat. Anim. Health20(4): 202-206.
Sulfuric acid copper(2+) salt (1:1)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	96	NR	NR	ug/L	LAB	2000. Villar, C.A., S.E. Gomez, and C.A. Bentos. Lethal Concentration of Cu in the Neotropical Fish Cnesterodon decemmaculatus (Pisces, Cyprinodontiformes). Bull. Environ. Contam. Toxicol.65(4): 465-469.
Sulfuric acid copper(2+) salt (1:1)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	151	NR	NR	ug/L	LAB	2000. Villar, C.A., S.E. Gomez, and C.A. Bentos. Lethal Concentration of Cu in the Neotropical Fish Cnesterodon decemmaculatus (Pisces, Cyprinodontiformes). Bull. Environ. Contam. Toxicol.65(4): 465-469.
Sulfuric acid copper(2+) salt (1:1)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	157	NR	NR	ug/L	LAB	2000. Villar, C.A., S.E. Gomez, and C.A. Bentos. Lethal Concentration of Cu in the Neotropical Fish Cnesterodon decemmaculatus (Pisces, Cyprinodontiformes). Bull. Environ. Contam. Toxicol.65(4): 465-469.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Threespine Stickleback	Fish	Fresh	Growth	LOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	LOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	LOEC	Not Reported	D	20	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	LOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	LOEC	Not Reported	T	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	LOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	20	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	20	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	20	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	4	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	20	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	20	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	20	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NOEC	Not Reported	D	57	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Copper	Threespine Stickleback	Fish	Fresh	Growth	NR	Not Reported	D	NR	NR	NR	ug/L	FIELDA	2007. Roussel, H., S. Joachim, S. Lamothe, O. Palluel, L. Gauthier, and J.M. Bonzom. A Long-Term Copper Exposure on Freshwater Ecosystem Using Lotic Mesocosms: Individual and Population Responses of Three-Spined Sticklebacks (Gasterosteus aculeatus). Aquat. Toxicol.82(4): 272-280.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC01	Not Reported	T	100.8	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC01	Not Reported	T	150.9	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC01	Not Reported	T	98.1	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC01	Not Reported	T	114.2	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC01	Not Reported	T	38.7	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC01	Not Reported	T	39.8	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC01	Not Reported	T	42.9	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC10	Not Reported	T	176.6	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC10	Not Reported	T	185.4	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC10	Not Reported	T	259.1	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC10	Not Reported	T	164.2	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC10	Not Reported	T	78.2	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC10	Not Reported	T	84.7	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC10	Not Reported	T	96.8	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC5	Not Reported	T	145.3	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC5	Not Reported	T	148.6	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC5	Not Reported	T	214.7	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC5	Not Reported	T	144.7	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC5	Not Reported	T	61.2	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC5	Not Reported	T	65.1	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC5	Not Reported	T	72.9	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	2780	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	215.3	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	297.9	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	351.6	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	503	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	1960	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	1590	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	1490	NR	NR	ug/L	LAB	1996. Svecevicius, G., and M.Z. Vosyliene. Acute Toxicity of Copper to Common Freshwater Fishes of Lithuania. Ekologija2: 17-21.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	185.1	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	214.3	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	256.3	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC50	Not Reported	T	262.2	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC90	Not Reported	T	700	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC90	Not Reported	T	883.7	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC90	Not Reported	T	976.3	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC90	Not Reported	T	400.2	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC90	Not Reported	T	438.7	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC90	Not Reported	T	542.1	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC90	Not Reported	T	710.7	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC95	Not Reported	T	1102.6	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC95	Not Reported	T	1178.3	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC95	Not Reported	T	850.8	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC95	Not Reported	T	454	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC95	Not Reported	T	560.2	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC95	Not Reported	T	705.2	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC95	Not Reported	T	942.7	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC99	Not Reported	T	1226.9	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC99	Not Reported	T	1670	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC99	Not Reported	T	1676.6	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC99	Not Reported	T	1154.9	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC99	Not Reported	T	1601.8	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC99	Not Reported	T	575.3	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	LC99	Not Reported	T	886.1	NR	NR	ug/L	LAB	2005. Gravenmier, J.J., D.W. Johnston, R.C. Santore, and W.R. Arnold. Acute Toxicity of Copper to the Threespine Stickleback, Gasterosteus aculeatus. Environ. Toxicol.20(2): 150-159.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	2*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	1*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	1*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.5*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.3*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.2*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.2*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.1*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.07*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	15	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.03*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.03*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.02*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.01*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Copper(2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.007*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Sanchez, W., O. Palluel, L. Meunier, M. Coquery, J.M. Porcher, and S. Ait-Aissa. Copper-Induced Oxidative Stress in Three-Spined Stickleback: Relationship with Hepatic Metal Levels. Environ. Toxicol. Pharmacol.19(1): 177-183.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	1.20*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	1600*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	2000*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	2400*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	3200*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	4.00*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	180		NC	ug/L	LAB	2003. Straus, D.L.. The Acute Toxicity of Copper to Blue Tilapia in Dilutions of Settled Pond Water. Aquaculture219(1-4): 233-240.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	43060		NC	ug/L	LAB	2003. Straus, D.L.. The Acute Toxicity of Copper to Blue Tilapia in Dilutions of Settled Pond Water. Aquaculture219(1-4): 233-240.
Sulfuric acid copper(2+) salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	6610		NC	ug/L	LAB	2003. Straus, D.L.. The Acute Toxicity of Copper to Blue Tilapia in Dilutions of Settled Pond Water. Aquaculture219(1-4): 233-240.
Sulfuric acid copper(2+) salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	690		NC	ug/L	LAB	2003. Straus, D.L.. The Acute Toxicity of Copper to Blue Tilapia in Dilutions of Settled Pond Water. Aquaculture219(1-4): 233-240.
Sulfuric acid copper(2+) salt (1:1)	Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	144	NR	NR	ug/L	LAB	1994. Ghazaly, K.S.. Efficacy of Ascorbic Acid (Vitamin C) on Experimental Copper Intoxication in Tilapia zillii. Bull. Natl. Inst. Oceanogr. Fish.20(2): 249-257.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	176.4*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1982. Saxena, A.B., D.S. Rao, and Z.U. Khan. Studies on the Acute Toxicities of Copper, Mercury, and Cadmium to Danio malabaricus and Puntius ticto. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control17(5): 657-665.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	133.2*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	102.1*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	88.60*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	LOEC	Testes	T	22	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	LOEC	Testes	T	22	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	LOEC	Testes	T	22	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	LOEC	Testes	T	44	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	44	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	44	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	44	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	44	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	44	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	44	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NOEC	Testes	T	22	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NR	Testes	T	NR	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NR	Testes	T	NR	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NR	Testes	T	NR	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Reproduction	NR	Testes	T	NR	NR	NR	ug/L	LAB	1985. Shakila, S., and S.B. Wagh. Effect of Sub-lethal Concentrations of Two Heavy Metal Salts on Testis of Barbus ticto (Ham.). In: R.C.Dalela and U.H.Mane (Eds.), Proc.5th Natl.Symp.Assess.Environ.Pollut., Dec.20-22, 1984, Aurangabad, India: 143-149.
Sulfuric acid copper(2+) salt (1:1)	Walking Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	16500*	NA	NR	ug/L	LAB	1974. Mukherjee, S., and S. Bhattacharya. Effects of Some Industrial Pollutants on Fish Brain Cholinesterase Activity. Environ. Physiol. Biochem.4: 226-231.
Sulfuric acid copper(2+) salt (1:1)	Walking Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1989. Jana, S., and S.S. Sahana. Sensitivity of the Freshwater Fishes Clarias batrachus and Anabas testudineus to Heavy Metals. Environ. Ecol.7(2): 265-270.
Sulfuric acid copper(2+) salt (1:1)	Walleye	Fish	Fresh	Growth	NOEL	Not Reported	T	13	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Walleye	Fish	Fresh	Mortality	LOEL	Not Reported	T	47	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Walleye	Fish	Fresh	Mortality	NOEL	Not Reported	T	71	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Walleye	Fish	Fresh	Mortality	NOEL	Not Reported	T	21	NR	NR	ug/L	LAB	1977. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Continuous Exposure to Lead, Chromium, Copper and Cadmium on Eggs and Fry of Selected Freshwater Fish. U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Walleye	Fish	Fresh	Mortality	NR	Not Reported	T	13	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Walleye	Fish	Fresh	Mortality	NR	Not Reported	T	71	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Sulfuric acid copper(2+) salt (1:1)	Walleye	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	21	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Nitric acid, Copper(2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Nitric acid, Copper(2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Nitric acid, Copper(2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Nitric acid, Copper(2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	93	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	250		NC	ug/L	LAB	2007. Sharma, K.P., S. Sharma, P.K. Singh, S. Kumar, R. Grover, and P.K. Sharma. A Comparative Study on Characterization of Textile Wastewaters (Untreated and Treated) Toxicity by Chemical and Biological Tests. Chemosphere69(1): 48-54.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	940	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	157	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1989. Chagnon, N.L., and S.I. Guttman. Differential Survivorship of Allozyme Genotypes in Mosquitofish Populations Exposed to Copper or Cadmium. Environ. Toxicol. Chem.8(4): 319-326.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	460	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	370	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NR	NR	ug/L	LAB	2009. Sharma, S., N. Upreti, and K.P. Sharma. Monitoring Toxicity of an Azo Dye Methyl Red and a Heavy Metal Cu, Using Plant and Animal Bioassays. Toxicol. Environ. Chem.91(1): 109-120.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	128	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	175	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	57	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	77	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	1110	NA	NR	ug/L	LAB	1979. Duke, R.C., G.W. Workman, and C.J. Hurst. The Effect of Potassium Phosphate on Cutrine and Copper Sulfate Toxicity to Mosquitofish (Gambusia affinis). Encyclia56: 23-33.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	1320	NA	NR	ug/L	LAB	1979. Duke, R.C., G.W. Workman, and C.J. Hurst. The Effect of Potassium Phosphate on Cutrine and Copper Sulfate Toxicity to Mosquitofish (Gambusia affinis). Encyclia56: 23-33.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1979. Duke, R.C., G.W. Workman, and C.J. Hurst. The Effect of Potassium Phosphate on Cutrine and Copper Sulfate Toxicity to Mosquitofish (Gambusia affinis). Encyclia56: 23-33.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	26450	NA	NR	ug/L	LAB	1979. Duke, R.C., G.W. Workman, and C.J. Hurst. The Effect of Potassium Phosphate on Cutrine and Copper Sulfate Toxicity to Mosquitofish (Gambusia affinis). Encyclia56: 23-33.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	3670	NA	NR	ug/L	LAB	1979. Duke, R.C., G.W. Workman, and C.J. Hurst. The Effect of Potassium Phosphate on Cutrine and Copper Sulfate Toxicity to Mosquitofish (Gambusia affinis). Encyclia56: 23-33.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	810	NA	NR	ug/L	LAB	1979. Duke, R.C., G.W. Workman, and C.J. Hurst. The Effect of Potassium Phosphate on Cutrine and Copper Sulfate Toxicity to Mosquitofish (Gambusia affinis). Encyclia56: 23-33.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	8180	NA	NR	ug/L	LAB	1979. Duke, R.C., G.W. Workman, and C.J. Hurst. The Effect of Potassium Phosphate on Cutrine and Copper Sulfate Toxicity to Mosquitofish (Gambusia affinis). Encyclia56: 23-33.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	9230	NA	NR	ug/L	LAB	1979. Duke, R.C., G.W. Workman, and C.J. Hurst. The Effect of Potassium Phosphate on Cutrine and Copper Sulfate Toxicity to Mosquitofish (Gambusia affinis). Encyclia56: 23-33.
Copper	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	49	NA	NR	ug/L	LAB	1978. Taylor, J.L.. Toxicity of Copper and Zinc in Two Arkansas Streams to Mosquitofish (Gambusia affinis). Bios49(3): 99-106.
Copper	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	56	NA	NR	ug/L	LAB	1978. Taylor, J.L.. Toxicity of Copper and Zinc in Two Arkansas Streams to Mosquitofish (Gambusia affinis). Bios49(3): 99-106.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	48800*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	33600*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	30000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	27200*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Copper	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	3.2	NA	NR	ug/L	LAB	1978. Taylor, J.L.. Toxicity of Copper and Zinc in Two Arkansas Streams to Mosquitofish (Gambusia affinis). Bios49(3): 99-106.
Copper	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	160	NA	NR	ug/L	LAB	1988. Chagnon, N.L., and S.I. Guttman. Differential Survivorship of Allozyme Genotypes in Mosquitofish (Gambusia affinis) Population Exposed to Copper or Cadmium. Ohio J. Sci.88(2): 46.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	1.60*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	2.40*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	2000*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	2400*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	2400*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	3200*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	3200*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	4.00*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	4.00*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	4000*	NA	NR	ug/L	LAB	1977. Johnson, C.R.. The Effects of Copper Sulphate Exposure on Thermal Tolerance, Orientation and Survival in Adult Mosquitofish, Gambusia affinis, and Juvenile Threespined Sticklebacks, Gasterosteus aculeatus. Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc. Inc.45: 66-68.
Sulfuric acid copper(2+) salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	10000		NR	ug/L	LAB	1976. Ahmed, W., and R.K. Washino. Toxicity of Pesticides Used in Rice Culture in California to Gambusia affinis (Baird and Girard). Ph.D.Thesis, Univ.of California, Davis, CA: 31 p..
Sulfuric acid copper(2+) salt (1:1)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid copper(2+) salt (1:1)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid copper(2+) salt (1:1)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid copper(2+) salt (1:1)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	720	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid copper(2+) salt (1:1)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	780	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Copper	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	11500	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	7900	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Copper	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	6400	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nitric acid, Copper(2+) salt	White Perch	Fish	Fresh	Mortality	LC50*	Not Reported	T	11800	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nitric acid, Copper(2+) salt	White Perch	Fish	Fresh	Mortality	LC50*	Not Reported	T	8000	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nitric acid, Copper(2+) salt	White Perch	Fish	Fresh	Mortality	LC50*	Not Reported	T	6200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	NR	Growth	NR	Whole Organism	T	12.9	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	NR	Growth	NR	Whole Organism	T	33.8	NR	NR	ug/L	NR	1978. McKim, J.M., J.G. Eaton, and G.W. Holcombe. Metal Toxicity to Embryos and Larvae of Eight Species of Freshwater Fish - II. Copper. Bull. Environ. Contam. Toxicol.19: 608-616.
Copper	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	886	NR	NR	ug/L	LAB	1986. Munkittrick, K.R., and D.G. Dixon. In Situ Assessment of Mixed Copper and Zinc Impacts on White Sucker (Catostomus commersoni) Populations in Several Northern Ontario Lakes. In: Technology Transfer Conference, Part B: Water Quality Research, Dec.8-9, 1986, Toronto, Ont., Can.: 165-191.
Copper	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	886	NA	NR	ug/L	LAB	1987. Munkittrick, K.R., and D.G. Dixon. Assessment of Reproductive Capacity and Larval Development of Feral White Suckers (Catostomus commersoni) Exposed to Chronic Elevations of Copper and Zinc. In: J.S.S.Lakshminarayana (Ed.), Proc.13th Annual Aquatic Toxicity Workshop, Nov.12-14, 1986, Moncton, New Brunswick, Can.Tech.Rep.Fish.Aquat.Sci.No.1575: 44-46.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1987. Munkittrick, K.R., and D.G. Dixon. Assessment of Reproductive Capacity and Larval Development of Feral White Suckers (Catostomus commersoni) Exposed to Chronic Elevations of Copper and Zinc. In: J.S.S.Lakshminarayana (Ed.), Proc.13th Annual Aquatic Toxicity Workshop, Nov.12-14, 1986, Moncton, New Brunswick, Can.Tech.Rep.Fish.Aquat.Sci.No.1575: 44-46.
Copper	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1275	NR	NR	ug/L	LAB	1986. Munkittrick, K.R., and D.G. Dixon. In Situ Assessment of Mixed Copper and Zinc Impacts on White Sucker (Catostomus commersoni) Populations in Several Northern Ontario Lakes. In: Technology Transfer Conference, Part B: Water Quality Research, Dec.8-9, 1986, Toronto, Ont., Can.: 165-191.
Copper	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1275	NA	NR	ug/L	LAB	1987. Munkittrick, K.R., and D.G. Dixon. Assessment of Reproductive Capacity and Larval Development of Feral White Suckers (Catostomus commersoni) Exposed to Chronic Elevations of Copper and Zinc. In: J.S.S.Lakshminarayana (Ed.), Proc.13th Annual Aquatic Toxicity Workshop, Nov.12-14, 1986, Moncton, New Brunswick, Can.Tech.Rep.Fish.Aquat.Sci.No.1575: 44-46.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1899	NA	NR	ug/L	LAB	1989. Munkittrick, K.R., and D.G. Dixon. Effects of Natural Exposure to Copper and Zinc on Egg Size and Larval Copper Tolerance in White Sucker (Catostomus commersoni). Ecotoxicol. Environ. Saf.18(1): 15-26.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	2074	NA	NR	ug/L	LAB	1989. Munkittrick, K.R., and D.G. Dixon. Effects of Natural Exposure to Copper and Zinc on Egg Size and Larval Copper Tolerance in White Sucker (Catostomus commersoni). Ecotoxicol. Environ. Saf.18(1): 15-26.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1051	NR	NR	ug/L	LAB	1988. Munkittrick, K.R., and D.G. Dixon. Evidence for a Maternal Yolk Factor Associated with Increased Tolerance and Resistance of Feral White Sucker (Catostomus commersoni) to Waterborne Copper. Ecotoxicol. Environ. Saf.15(1): 7-20.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1273	NR	NR	ug/L	LAB	1988. Munkittrick, K.R., and D.G. Dixon. Evidence for a Maternal Yolk Factor Associated with Increased Tolerance and Resistance of Feral White Sucker (Catostomus commersoni) to Waterborne Copper. Ecotoxicol. Environ. Saf.15(1): 7-20.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	422.8	NR	NR	ug/L	LAB	1988. Munkittrick, K.R., and D.G. Dixon. Evidence for a Maternal Yolk Factor Associated with Increased Tolerance and Resistance of Feral White Sucker (Catostomus commersoni) to Waterborne Copper. Ecotoxicol. Environ. Saf.15(1): 7-20.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	826	NR	NR	ug/L	LAB	1988. Munkittrick, K.R., and D.G. Dixon. Evidence for a Maternal Yolk Factor Associated with Increased Tolerance and Resistance of Feral White Sucker (Catostomus commersoni) to Waterborne Copper. Ecotoxicol. Environ. Saf.15(1): 7-20.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1210	NA	NR	ug/L	LAB	1989. Munkittrick, K.R., and D.G. Dixon. Effects of Natural Exposure to Copper and Zinc on Egg Size and Larval Copper Tolerance in White Sucker (Catostomus commersoni). Ecotoxicol. Environ. Saf.18(1): 15-26.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1264	NA	NR	ug/L	LAB	1989. Munkittrick, K.R., and D.G. Dixon. Effects of Natural Exposure to Copper and Zinc on Egg Size and Larval Copper Tolerance in White Sucker (Catostomus commersoni). Ecotoxicol. Environ. Saf.18(1): 15-26.
Copper	White Sucker	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1995. Sloterdijk, H.H., A.M. Prud'homme, and J. Bureau. Hepatic Metallothionein Concentrations in White Sucker (Catostomus commersoni) from the St. Lawrence River: 1. Effects of Storage Conditions; 2. Correlation with Hepatic Heavy Metals. In: G.F.Westlake, J.L.Parrott and A.J.Niimi (Eds.), Proc.21st Annual Aquatic Toxicity Workshop, Oct.3-5, 1994, Sarnia, Ontario; Can.Tech.Rep.Fish.Aquat.Sci.No.2050: 117-126.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1988. Munkittrick, K.R., and D.G. Dixon. Evidence for a Maternal Yolk Factor Associated with Increased Tolerance and Resistance of Feral White Sucker (Catostomus commersoni) to Waterborne Copper. Ecotoxicol. Environ. Saf.15(1): 7-20.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1988. Munkittrick, K.R., and D.G. Dixon. Evidence for a Maternal Yolk Factor Associated with Increased Tolerance and Resistance of Feral White Sucker (Catostomus commersoni) to Waterborne Copper. Ecotoxicol. Environ. Saf.15(1): 7-20.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1988. Munkittrick, K.R., and D.G. Dixon. Evidence for a Maternal Yolk Factor Associated with Increased Tolerance and Resistance of Feral White Sucker (Catostomus commersoni) to Waterborne Copper. Ecotoxicol. Environ. Saf.15(1): 7-20.
Sulfuric acid copper(2+) salt (1:1)	White Sucker	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1988. Munkittrick, K.R., and D.G. Dixon. Evidence for a Maternal Yolk Factor Associated with Increased Tolerance and Resistance of Feral White Sucker (Catostomus commersoni) to Waterborne Copper. Ecotoxicol. Environ. Saf.15(1): 7-20.
Sulfuric acid copper(2+) salt (1:1)	Yellow Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	0.44		NC	umol/L	LAB	2003. Taylor, L.N., C.M. Wood, and D.G. McDonald. An Evaluation of Sodium Loss and Gill Metal Binding Properties in Rainbow Trout and Yellow Perch to Explain Species Differences in Copper Tolerance. Environ. Toxicol. Chem.22(9): 2159-2166.
Sulfuric acid copper(2+) salt (1:1)	Yellow Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	1.05		NC	umol/L	LAB	2003. Taylor, L.N., C.M. Wood, and D.G. McDonald. An Evaluation of Sodium Loss and Gill Metal Binding Properties in Rainbow Trout and Yellow Perch to Explain Species Differences in Copper Tolerance. Environ. Toxicol. Chem.22(9): 2159-2166.
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	730	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	94	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	98	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	75	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	94	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	70	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	89	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	76	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Yellowbelly, Golden Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	85	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Growth	LOEL	Whole Organism	T	630		NC	ug/L	LAB	2002. Nguyen, L.T.H., and C.R. Janssen. Embryo-Larval Toxicity Tests with the African Catfish (Clarias gariepinus): Comparative Sensitivity of Endpoints. Arch. Environ. Contam. Toxicol.42(2): 256-262.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Growth	NOEL	Whole Organism	T	300		NC	ug/L	LAB	2002. Nguyen, L.T.H., and C.R. Janssen. Embryo-Larval Toxicity Tests with the African Catfish (Clarias gariepinus): Comparative Sensitivity of Endpoints. Arch. Environ. Contam. Toxicol.42(2): 256-262.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Growth	NOEL	Not Reported	T	1500000		NC	ug/L	LAB	2007. Hoyle, I., B.J. Shaw, and R.D. Handy. Dietary Copper Exposure in the African Walking Catfish, Clarias gariepinus: Transient Osmoregulatory Disturbances and Oxidative Stress. Aquat. Toxicol.83(1): 62-72.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1999. Nguyen, L.T.H., C.R. Janssen, and F.A.M. Volckaert. Susceptibility of Embryonic and Larval African Catfish (Clarias gariepinus) to Toxicants. Bull. Environ. Contam. Toxicol.62(2): 230-237.
Copper	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	4540	NR	NR	ug/L	LAB	2007. Abdel-Tawwab, M., M.A.A. Mousa, and F.E. Abbass. Growth Performance and Physiological Response of African Catfish, Clarias gariepinus (B.) Fed Organic Selenium Prior to the Exposure to Environmental Copper Toxicity. Aquaculture272(1-4): 335-345.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.61	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	2.38	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	3.62	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.42	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.68	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.87	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	2.28	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.28	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.48	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.48	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.68	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.2	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.29	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.3	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	1.38	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	710	NR	NR	ug/L	LAB	1995. Oronsaye, J.A.O., and P.E. Ogbebo. The Acute Toxicity of Copper to Clarias Gariepinus in Soft Water. J. Aquat. Sci.10: 19-23.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	480	NR	NR	ug/L	LAB	1995. Oronsaye, J.A.O., and P.E. Ogbebo. The Acute Toxicity of Copper to Clarias Gariepinus in Soft Water. J. Aquat. Sci.10: 19-23.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	420	NR	NR	ug/L	LAB	1995. Oronsaye, J.A.O., and P.E. Ogbebo. The Acute Toxicity of Copper to Clarias Gariepinus in Soft Water. J. Aquat. Sci.10: 19-23.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	NOEL	Not Reported	T	2500		NC	ug/L	LAB	2002. Nguyen, L.T.H., and C.R. Janssen. Embryo-Larval Toxicity Tests with the African Catfish (Clarias gariepinus): Comparative Sensitivity of Endpoints. Arch. Environ. Contam. Toxicol.42(2): 256-262.
Copper	Zambezi Barbel	Fish	Fresh	Mortality	NR	Not Reported	T	900	NR	NR	ug/L	LAB	2006. Wegwu, M.O., and J.O. Akaninwor. Assessment of Heavy-Metal Profile of the New Calabar River and Its Impact on Juvenile Clarias gariepinus. Chem. Biodivers.3(1): 79-87.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1995. Oronsaye, J.A.O., and P.E. Ogbebo. The Acute Toxicity of Copper to Clarias Gariepinus in Soft Water. J. Aquat. Sci.10: 19-23.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Nguyen, L.T.H., C.R. Janssen, and F.A.M. Volckaert. Susceptibility of Embryonic and Larval African Catfish (Clarias gariepinus) to Toxicants. Bull. Environ. Contam. Toxicol.62(2): 230-237.
Copper	Zambezi Barbel	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	900	NR	NR	ug/L	LAB	2006. Wegwu, M.O., and J.O. Akaninwor. Assessment of Heavy-Metal Profile of the New Calabar River and Its Impact on Juvenile Clarias gariepinus. Chem. Biodivers.3(1): 79-87.
Copper	Zambezi Barbel	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	900	NR	NR	ug/L	LAB	2006. Wegwu, M.O., and J.O. Akaninwor. Assessment of Heavy-Metal Profile of the New Calabar River and Its Impact on Juvenile Clarias gariepinus. Chem. Biodivers.3(1): 79-87.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1.629	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2.22	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2.263	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3.326	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper	Zambezi Barbel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	590	NR	NR	ug/L	LAB	1998. Annune, P.A., and F.T.A. Ahuma. Haematological Changes in Mudfish, Clarias gariepinus (Burch) Exposed to Sublethal Concentrations of Copper and Lead. J. Aquat. Sci.13: 33-36.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.514	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.543	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.617	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Copper chloride (CuCl2)	Zambezi Barbel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.79	NA	NR	%	LAB	1993. Van der Merwe, M., J.H.J. Van Vuren, and H.H. Du Preez. Lethal Copper Concentration Levels for Clarias gariepinus (Burchell, 1822) - a Preliminary Study. Koedoe36(2): 77-86.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid copper(2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid copper(2+) salt (1:1)	Zander	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1975. Stangenberg, M.. The Influence of the Chemical Composition of Water on the Pike Perch (Lucioperca lucioperca L.) Fry from the Lake Gopio. Limnologica9(3): 421-426.
Sulfuric acid copper(2+) salt (1:1)	Zander	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1975. Stangenberg, M.. The Influence of the Chemical Composition of Water on the Pike Perch (Lucioperca lucioperca L.) Fry from the Lake Gopio. Limnologica9(3): 421-426.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	LOEC	Whole Organism	T	20	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	LOEC	Whole Organism	T	4	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	LOEL	Embryo	T	92.98	NR	NR	ug/L	LAB	2007. Johnson, A., E. Carew, and K.A. Sloman. The Effects of Copper on the Morphological and Functional Development of Zebrafish Embryos. Aquat. Toxicol.84(4): 431-438.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	MATC	Whole Organism	T	8.9	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	MATC	Whole Organism	T	1.78	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	NOEC	Whole Organism	T	4	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	NOEC	Whole Organism	T	0.8	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	NOEL	Embryo	T	53.13	NR	NR	ug/L	LAB	2007. Johnson, A., E. Carew, and K.A. Sloman. The Effects of Copper on the Morphological and Functional Development of Zebrafish Embryos. Aquat. Toxicol.84(4): 431-438.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	NOEL	Whole Organism	T	1368000	NR	NR	ug/L	LAB	2007. Alsop, D., S. Brown, and G. Van der Kraak. The Effects of Copper and Benzo(a)pyrene on Retinoids and Reproduction in Zebrafish. Aquat. Toxicol.82(4): 281-295.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	NR	Not Reported	D	8	NR	NR	ug/L	LAB	2009. Craig, P.M., M. Galus, C.M. Wood, and G.B. McClelland. Dietary Iron Alters Waterborne Copper-Induced Gene Expression in Soft Water Acclimated Zebrafish (Danio rerio). Am. J. Physiol., Regul. Integr. Comp. Physiol.296(2): R362 - R373.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	EC50	Not Reported	T	2900	NR	NR	ug/L	LAB	2008. Lahnsteiner, F.. The Sensitivity and Reproducibility of the Zebrafish (Danio rerio) Embryo Test for the Screening of Waste Water Quality and for Testing the Toxicity of Chemicals. ATLA Altern. Lab. Anim.36(3): 299-311.
Copper oxide (Cu2O)	Zebra Danio	Fish	Fresh	Mortality	LC10	Not Reported	T	31		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC10	Not Reported	T	21		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Copper	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	5.16	NR	NR	uM	LAB	2006. Chan, K.M., L.L. Ku, P.C.Y. Chan, and W.K. Cheuk. Metallothionein Gene Expression in Zebrafish Embryo-Larvae and ZFL Cell-Line Exposed to Heavy Metal Ions. Mar. Environ. Res.62(suppl.1): S83 - S87.
Copper	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	D	1560	NR	NR	ug/L	LAB	2007. Griffitt, R.J., R. Weil, K.A. Hyndman, N.D. Denslow, K. Powers, D. Taylor, and D.S. Barber. Exposure to Copper Nanoparticles Causes Gill Injury and Acute Lethality in Zebrafish (Danio rerio). Environ. Sci. Technol.41(23): 8178-8186.
Copper chloride (CuCl)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	D	130		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Copper chloride (CuCl)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	D	1780		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Copper chloride (CuCl)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	D	710		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Copper chloride (CuCl)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	D	940		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Copper oxide (Cu2O)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	75		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Nitric acid, Copper(2+) salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	990	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Copper(2+) salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	570	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Copper(2+) salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Copper(2+) salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Nitric acid, Copper(2+) salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1981. Bellavere, C., and J. Gorbi. A Comparative Analysis of Acute Toxicity of Chromium, Copper, and Cadmium to Daphnia magna, Biomphalaria glabrata, and Brachydanio rerio. Environ. Technol. Lett.2(3): 119-128.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	38		NC	ug/L	LAB	2004. De Oliveira-Filho, E.C., R.M. Lopes, and F.J.R. Paumgartten. Comparative Study on the Susceptibility of Freshwater Species to Copper-Based Pesticides. Chemosphere56(4): 369-374.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	280.16	NR	NR	uM	LAB	2006. Hernandez, P.P., V. Moreno, F.A. Olivari, and M.L. Allende. Sub-Lethal Concentrations of Waterborne Copper are Toxic to Lateral Line Neuromasts in Zebrafish (Danio rerio). Hear. Res.213(1-2): 1-10.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Devillers, J., T. Meunier, and P. Chambon. Usefulness of the Dosage-Effect-Time Relation in Ecotoxicology for the Determination of Different Chemical Classes of Toxicants (Interet de la Relation Dose-Effet-Temps en Ecotoxicologie pour la Determination des Differe. Tech.Sci.Munic.80: 329-334.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Devillers, J., T. Meunier, and P. Chambon. Usefulness of the Dosage-Effect-Time Relation in Ecotoxicology for the Determination of Different Chemical Classes of Toxicants (Interet de la Relation Dose-Effet-Temps en Ecotoxicologie pour la Determination des Differe. Tech.Sci.Munic.80: 329-334.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Devillers, J., T. Meunier, and P. Chambon. Usefulness of the Dosage-Effect-Time Relation in Ecotoxicology for the Determination of Different Chemical Classes of Toxicants (Interet de la Relation Dose-Effet-Temps en Ecotoxicologie pour la Determination des Differe. Tech.Sci.Munic.80: 329-334.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Devillers, J., T. Meunier, and P. Chambon. Usefulness of the Dosage-Effect-Time Relation in Ecotoxicology for the Determination of Different Chemical Classes of Toxicants (Interet de la Relation Dose-Effet-Temps en Ecotoxicologie pour la Determination des Differe. Tech.Sci.Munic.80: 329-334.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	167	NA	NR	ug/L	LAB	1977. Fogels, A., and J.B. Sprague. Comparative Short-Term Tolerance of Zebrafish, Flagfish, and Rainbow Trout to Five Poisons Including Potential Reference Toxicants. Water Res.11(9): 811-817.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1978. Slooff, W.. Biological Monitoring Based on Fish Respiration for Continuous Water Quality Control. In: O.Hutzinger, I.H.Van Lelyveld and B.C.J.Zoeteman (Eds.), Aquatic Pollutants: Transformation and Biological Effects, Pergamon Press, NY: 501-506.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1979. Slooff, W.. Detection Limits of a Biological Monitoring System Based on Fish Respiration. Bull. Environ. Contam. Toxicol.23(4/5): 517-523.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	D	250	NR	NR	ug/L	LAB	2007. Griffitt, R.J., R. Weil, K.A. Hyndman, N.D. Denslow, K. Powers, D. Taylor, and D.S. Barber. Exposure to Copper Nanoparticles Causes Gill Injury and Acute Lethality in Zebrafish (Danio rerio). Environ. Sci. Technol.41(23): 8178-8186.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	149	NA	NR	ug/L	LAB	1977. Fogels, A., and J.B. Sprague. Comparative Short-Term Tolerance of Zebrafish, Flagfish, and Rainbow Trout to Five Poisons Including Potential Reference Toxicants. Water Res.11(9): 811-817.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	96	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	116.41	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	44.09	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	46.7	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	80.81	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	81.14	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	1.2	NR	NR	uM	LAB	2006. Seok, S.H., J.H. Park, M.W. Baek, H.Y. Lee, D.J. Kim, H.M. Uhm, J.J. Hong, Y.R. Na, B.H. Jin, and D.Y. Ryu. Specific Activation of the Human HSP70 Promoter by Copper Sulfate in Mosaic Transgenic Zebrafish. J. Biotechnol.126(3): 406-413.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	630	NR	NR	ug/L	LAB	2006. Paris-Palacios, S., and S. Biagianti-Risbourg. Hepatocyte Nuclear Structure and Subcellular Distribution of Copper in Zebrafish Brachydanio rerio and Roach Rutilus rutilus (Teleostei, Cyprinidae) Exposed to Copper Sulphate. Aquat. Toxicol.77(3): 306-313.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	98	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	95	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	86	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	88	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	88	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	88	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	88	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Bresch, H.. Investigation of the Long-Term Action of Xenobiotics on Fish with Special Regard to Reproduction. Ecotoxicol. Environ. Saf.6(1): 102-112.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1994. Meinelt, T., and G. Staaks. The Embryo-Larval Test with Zebrafish (Brachydanio rerio): Validity, Limits and Perspectives. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 15, Fishing News Books, London: 167-174.
Copper	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1994. Meinelt, T., and G. Staaks. The Embryo-Larval Test with Zebrafish (Brachydanio rerio): Validity, Limits and Perspectives. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 15, Fishing News Books, London: 167-174.
Copper	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	150	NR	NR	ug/L	LAB	1995. Meinelt, T., and A. Stueber. Subchronic Fish Toxicity of Copper and Zinc Dependent upon Water Hardness. Fortschr. Fisch. Wiss.12: 129-136.
Copper	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	150	NR	NR	ug/L	LAB	1994. Meinelt, T., and G. Staaks. The Embryo-Larval Test with Zebrafish (Brachydanio rerio): Validity, Limits and Perspectives. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 15, Fishing News Books, London: 167-174.
Copper	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1995. Meinelt, T., and A. Stueber. Subchronic Fish Toxicity of Copper and Zinc Dependent upon Water Hardness. Fortschr. Fisch. Wiss.12: 129-136.
Copper	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1994. Meinelt, T., and G. Staaks. The Embryo-Larval Test with Zebrafish (Brachydanio rerio): Validity, Limits and Perspectives. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 15, Fishing News Books, London: 167-174.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	200	NR	NR	uM	LAB	2006. Tilton, F., J.K. La Du, M. Vue, N. Alzarban, and R.L. Tanguay. Dithiocarbamates have a Common Toxic Effect on Zebrafish Body Axis Formation. Toxicol. Appl. Pharmacol.216(1): 55-68.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEL	Not Reported	T	53.13	NR	NR	ug/L	LAB	2007. Johnson, A., E. Carew, and K.A. Sloman. The Effects of Copper on the Morphological and Functional Development of Zebrafish Embryos. Aquat. Toxicol.84(4): 431-438.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEL	Not Reported	T	53.13	NR	NR	ug/L	LAB	2007. Johnson, A., E. Carew, and K.A. Sloman. The Effects of Copper on the Morphological and Functional Development of Zebrafish Embryos. Aquat. Toxicol.84(4): 431-438.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEL	Not Reported	T	92.98	NR	NR	ug/L	LAB	2007. Johnson, A., E. Carew, and K.A. Sloman. The Effects of Copper on the Morphological and Functional Development of Zebrafish Embryos. Aquat. Toxicol.84(4): 431-438.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	1.41	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	8.9	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	8.9	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Copper	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	1994. Meinelt, T., and G. Staaks. The Embryo-Larval Test with Zebrafish (Brachydanio rerio): Validity, Limits and Perspectives. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 15, Fishing News Books, London: 167-174.
Copper	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Meinelt, T., and A. Stueber. Subchronic Fish Toxicity of Copper and Zinc Dependent upon Water Hardness. Fortschr. Fisch. Wiss.12: 129-136.
Copper	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	1994. Meinelt, T., and G. Staaks. The Embryo-Larval Test with Zebrafish (Brachydanio rerio): Validity, Limits and Perspectives. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 15, Fishing News Books, London: 167-174.
Copper chloride (CuCl2)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	ug/L	LAB	1992. Rougier, F., A. Menudier, D. Troutaud, C. Bosgiraud, A. Ndoye, J.A. Nicolas, and P. Deschaux. In Vivo Effect of Zinc and Copper on the Development of Listeriosis in Zebrafish, Brachydanio rerio (Hamilton-Buchanan). J. Fish Dis.15(5): 453-456.
Copper chloride (CuCl2)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	250	NR	NR	ug/L	LAB	1992. Rougier, F., A. Menudier, D. Troutaud, C. Bosgiraud, A. Ndoye, J.A. Nicolas, and P. Deschaux. In Vivo Effect of Zinc and Copper on the Development of Listeriosis in Zebrafish, Brachydanio rerio (Hamilton-Buchanan). J. Fish Dis.15(5): 453-456.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.05	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	uM	LAB	2006. Tilton, F., J.K. La Du, M. Vue, N. Alzarban, and R.L. Tanguay. Dithiocarbamates have a Common Toxic Effect on Zebrafish Body Axis Formation. Toxicol. Appl. Pharmacol.216(1): 55-68.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.21	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.

Table C-12. Summary of Results from the EcoTox Database for Fish - Copper

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	4	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	4	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEL	Not Reported	T	53.13	NR	NR	ug/L	LAB	2007. Johnson, A., E. Carew, and K.A. Sloman. The Effects of Copper on the Morphological and Functional Development of Zebrafish Embryos. Aquat. Toxicol.84(4): 431-438.
Copper chloride (CuCl2)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Rougier, F., A. Menudier, C. Bosgiraud, and J.A. Nicolas. Copper and Zinc Exposure of Zebrafish, Brachydanio rerio (Hamilton-Buchaman): Effects in Experimental Listeria Infection. Ecotoxicol. Environ. Saf.34(2): 134-140.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	2500	NR	NR	ug/L	LAB	2008. Lahnsteiner, F.. The Sensitivity and Reproducibility of the Zebrafish (Danio rerio) Embryo Test for the Screening of Waste Water Quality and for Testing the Toxicity of Chemicals. ATLA Altern. Lab. Anim.36(3): 299-311.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	2500	NR	NR	ug/L	LAB	2008. Lahnsteiner, F.. The Sensitivity and Reproducibility of the Zebrafish (Danio rerio) Embryo Test for the Screening of Waste Water Quality and for Testing the Toxicity of Chemicals. ATLA Altern. Lab. Anim.36(3): 299-311.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	2500	NR	NR	ug/L	LAB	2008. Lahnsteiner, F.. The Sensitivity and Reproducibility of the Zebrafish (Danio rerio) Embryo Test for the Screening of Waste Water Quality and for Testing the Toxicity of Chemicals. ATLA Altern. Lab. Anim.36(3): 299-311.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	2500	NR	NR	ug/L	LAB	2008. Lahnsteiner, F.. The Sensitivity and Reproducibility of the Zebrafish (Danio rerio) Embryo Test for the Screening of Waste Water Quality and for Testing the Toxicity of Chemicals. ATLA Altern. Lab. Anim.36(3): 299-311.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Copper chloride (CuCl2)	Zebra Danio	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250	NR	NR	ug/L	LAB	1992. Rougier, F., A. Menudier, D. Troutaud, C. Bosgiraud, A. Ndoye, J.A. Nicolas, and P. Deschaux. In Vivo Effect of Zinc and Copper on the Development of Listeriosis in Zebrafish, Brachydanio rerio (Hamilton-Buchanan). J. Fish Dis.15(5): 453-456.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1099.67	NR	NR	ug/L	LAB	2007. Johnson, A., E. Carew, and K.A. Sloman. The Effects of Copper on the Morphological and Functional Development of Zebrafish Embryos. Aquat. Toxicol.84(4): 431-438.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	128	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Copper	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	D	NR	ug/L	LAB	2009. Griffitt, R.J., K. Hyndman, N.D. Denslow, and D.S. Barber. Comparison of Molecular and Histological Changes in Zebrafish Gills Exposed to Metallic Nanoparticles. Toxicol. Sci.107(2): 404-415.
Copper chloride (CuCl2)	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Rougier, F., A. Menudier, C. Bosgiraud, and J.A. Nicolas. Copper and Zinc Exposure of Zebrafish, Brachydanio rerio (Hamilton-Buchaman): Effects in Experimental Listeria Infection. Ecotoxicol. Environ. Saf.34(2): 134-140.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	NR	NR	NR	ug/L	LAB	2009. Griffitt, R.J., K. Hyndman, N.D. Denslow, and D.S. Barber. Comparison of Molecular and Histological Changes in Zebrafish Gills Exposed to Metallic Nanoparticles. Toxicol. Sci.107(2): 404-415.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	15	NR	NR	ug/L	LAB	2007. Craig, P.M., C.M. Wood, and G.B. McClelland. Oxidative Stress Response and Gene Expression with Acute Copper Exposure in Zebrafish (Danio rerio). Am. J. Physiol., Regul. Integr. Comp. Physiol.293: R1882 - R1892.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	8	NR	NR	ug/L	LAB	2009. Craig, P.M., M. Galus, C.M. Wood, and G.B. McClelland. Dietary Iron Alters Waterborne Copper-Induced Gene Expression in Soft Water Acclimated Zebrafish (Danio rerio). Am. J. Physiol., Regul. Integr. Comp. Physiol.296(2): R362 - R373.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.16	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.16	NR	NR	ug/L	LAB	2008. Campagna, A.F., R. Fracacio, B.K. Rodrigues, M.N. Eler, N. Fenerich-Verani, and E.L.G. Espindola. Effects of the Copper in the Survival, Growth and Gill Morphology of Danio rerio (Cypriniformes, Cyprinidae). Acta Limnol. Brasil.20(3): 253-259.
Sulfuric acid copper(2+) salt (1:1)	Zebra Danio	Fish	Fresh	Reproduction	NOEL	Not Reported	T	1368000	NR	NR	ug/L	LAB	2007. Alsop, D., S. Brown, and G. Van der Kraak. The Effects of Copper and Benzo(a)pyrene on Retinoids and Reproduction in Zebrafish. Aquat. Toxicol.82(4): 281-295.

Table C-13. Summary of Results from the EcoTox Database for Fish - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron chloride (FeCl3)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	20260	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Sulfuric acid, Iron(2+) salt (1:1), Heptahydrate	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	51200	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Iron chloride (FeCl3)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Sulfuric acid, Iron (2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Sulfuric acid, Iron (2+) salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	50000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Sulfuric acid, Iron (2+) salt (1:1)	Bony Fishes	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Iron hydroxide	Brook Trout	Fish	Fresh	Growth	NR		T	6000	NA	NR	ug/L	LAB	1972. Sykora, J.L., E.J. Smith, and M. Synak. Effect of Lime Neutralized Iron Hydroxide Suspensions on Juvenile Brook Trout (Salvelinus fontinalis, Mitchill). Water Res.6: 935-950.
Iron hydroxide	Brook Trout	Fish	Fresh	Growth	NR		T	12000	NA	NR	ug/L	LAB	1972. Sykora, J.L., E.J. Smith, and M. Synak. Effect of Lime Neutralized Iron Hydroxide Suspensions on Juvenile Brook Trout (Salvelinus fontinalis, Mitchill). Water Res.6: 935-950.
Sulfuric acid, Iron (2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	410	NA	NR	ug/L	LAB	1975. Decker, C., and R. Menendez. Acute Toxicity of Iron and Aluminum to Brook Trout. W. Va. Acad. Sci.46(2): 159-167.
Sulfuric acid, Iron (2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	480	NA	NR	ug/L	LAB	1975. Decker, C., and R. Menendez. Acute Toxicity of Iron and Aluminum to Brook Trout. W. Va. Acad. Sci.46(2): 159-167.
Sulfuric acid, Iron (2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1750	NA	NR	ug/L	LAB	1975. Decker, C., and R. Menendez. Acute Toxicity of Iron and Aluminum to Brook Trout. W. Va. Acad. Sci.46(2): 159-167.
Sulfuric acid, Iron (2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3600	NA	NR	ug/L	LAB	1975. Decker, C., and R. Menendez. Acute Toxicity of Iron and Aluminum to Brook Trout. W. Va. Acad. Sci.46(2): 159-167.
Sulfuric acid, Iron (2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1975. Decker, C., and R. Menendez. Acute Toxicity of Iron and Aluminum to Brook Trout. W. Va. Acad. Sci.46(2): 159-167.
Sulfuric acid, Iron (2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4450	NA	NR	ug/L	LAB	1975. Decker, C., and R. Menendez. Acute Toxicity of Iron and Aluminum to Brook Trout. W. Va. Acad. Sci.46(2): 159-167.
Sulfuric acid, Iron (2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	F	133333	NA	NR	ug/L	NR	1927. Belding, D.L.. Toxicity Experiments with Fish in Reference to Trade Waste Pollution. I. The Problem of Water Pollution. Trans. Am. Fish. Soc.57: 100-119.
Sulfuric acid, Iron (2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1100	NA	NR	ug/L	LAB	1975. Decker, C., and R. Menendez. Acute Toxicity of Iron and Aluminum to Brook Trout. W. Va. Acad. Sci.46(2): 159-167.
Sulfuric acid, Iron (2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	45		NC	uM	LAB	1990. Gonzalez, R.J., R.S. Grippo, and W.A. Dunson. The Disruption of Sodium Balance in Brook Charr, Salvelinus fontinalis (Mitchill), by Manganese and Iron. J. Fish Biol.37(5): 765-774.
Sulfuric acid, Iron (2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	540	NA	NR	ug/L	LAB	1975. Decker, C., and R. Menendez. Acute Toxicity of Iron and Aluminum to Brook Trout. W. Va. Acad. Sci.46(2): 159-167.
Sulfuric acid, Iron (2+) salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1975. Decker, C., and R. Menendez. Acute Toxicity of Iron and Aluminum to Brook Trout. W. Va. Acad. Sci.46(2): 159-167.
Sulfuric acid, Iron(3+) salt (3:2)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	28000		NC	ug/L	LAB	1999. Dalzell, D.J.B., and N.A.A. MacFarlane. The Toxicity of Iron to Brown Trout and Effects on the Gills: A Comparison of Two Grades of Iron Sulphate. J. Fish Biol.55(2): 301-315.
Sulfuric acid, Iron(3+) salt (3:2)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	47000		NC	ug/L	LAB	1999. Dalzell, D.J.B., and N.A.A. MacFarlane. The Toxicity of Iron to Brown Trout and Effects on the Gills: A Comparison of Two Grades of Iron Sulphate. J. Fish Biol.55(2): 301-315.
Iron	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	460	NA	NR	ug/L	FIELDN	1983. Geertz-Hansen, P., and E. Mortensen. The Effect of Dissolved and Precipitated Iron on the Reproduction of Brown Trout (Salmo trutta). (Okkers Virkning Pa Reproduktionen Hos Orred. Vatten39(1): 55-62.
Iron chloride	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1770	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Embryonic and Larval Development of Brown Trout, Salmo trutta L.: Exposure to Trace Metal Mixtures in Soft Water. J. Fish Biol.38: 773-787.
Iron	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Peuranen, S., P.J. Vuorinen, M. Vuorinen, and A. Hollender. The Effects of Iron, Humic Acids and Low pH on the Gills and Physiology of Brown Trout (Salmo trutta). Ann. Zool. Fenn.31(4): 389-396.
Iron	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1983. Geertz-Hansen, P., and E. Mortensen. The Effect of Dissolved and Precipitated Iron on the Reproduction of Brown Trout (Salmo trutta). (Okkers Virkning Pa Reproduktionen Hos Orred. Vatten39(1): 55-62.
Iron chloride	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Effects of Six Trace Metals on Calcium Fluxes in Brown Trout (Salmo trutta L.) in Soft Water. J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.: 537-542.
Sulfuric acid, Iron(3+) salt (3:2)	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	6700		NC	ug/L	LAB	1999. Dalzell, D.J.B., and N.A.A. MacFarlane. The Toxicity of Iron to Brown Trout and Effects on the Gills: A Comparison of Two Grades of Iron Sulphate. J. Fish Biol.55(2): 301-315.

Table C-13. Summary of Results from the EcoTox Database for Fish - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Iron(3+) salt (3:2)	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	7400		NC	ug/L	LAB	1999. Dalzell, D.J.B., and N.A.A. MacFarlane. The Toxicity of Iron to Brown Trout and Effects on the Gills: A Comparison of Two Grades of Iron Sulphate. J. Fish Biol.55(2): 301-315.
Sulfuric acid, Iron (2+) salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	202990	NR	NR	ug/L	LAB	1982. Kapur, K., and N.A. Yadav. The Effects of Certain Heavy Metal Salts on the Development of Eggs in Common Carp, Cyprinus carpio var. communis. Acta Hydrochim. Hydrobiol.10(5): 517-522.
Iron hydroxide	Coho Salmon,Silver Salmon	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1976. Updegraff, K.F., and J.L. Sykora. Avoidance of Lime-Neutralized Iron Hydroxide Solutions by Coho Salmon in the Laboratory. Environ. Sci. Technol.10(1): 51-54.
Iron	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	560	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Sulfuric acid, Iron (2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Iron	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1220	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Sulfuric acid, Iron (2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1220	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Iron	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1360	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Sulfuric acid, Iron (2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1360	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Iron	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2250	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Sulfuric acid, Iron (2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2250	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Sulfuric acid, Iron (2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LOEL	Not Reported	T	5000		NC	kg/d	FIELDA	2002. Van Anholt, R.D., F.A.T. Spanings, A.H. Knol, J.A. Van der Velden, and S.E. Wendelaar Bonga. Effects of Iron Sulfate Dosage on the Water Flea (Daphnia magna Straus) and Early Development of Carp (Cyprinus carpio L.). Arch. Environ. Contam. Toxicol.42(2): 182-192.
Sulfuric acid, Iron (2+) salt (1:1)	Common Carp	Fish	Fresh	Mortality	LOEL	Not Reported	T	5000		NC	kg/d	FIELDA	2002. Van Anholt, R.D., F.A.T. Spanings, A.H. Knol, J.A. Van der Velden, and S.E. Wendelaar Bonga. Effects of Iron Sulfate Dosage on the Water Flea (Daphnia magna Straus) and Early Development of Carp (Cyprinus carpio L.). Arch. Environ. Contam. Toxicol.42(2): 182-192.
Iron	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Iron	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Iron	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	500	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Iron	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3000	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	1008	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	1610	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	2810	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21840	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	1010	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	570	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	320	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	23740	NR	NR	ug/L	LAB	1985. Birge, W.J., J.A. Black, A.G. Westerman, T.M. Short, S.B. Taylor, D.M. Bruser, and E.D. Wallingford. Recommendations on Numerical Values for Regulating Iron and Chloride Concentrations for the Purpose of Protecting Warmwater Species of Aquatic Life in the Commonwealth of Kentucky. University of Kentucky, Lexington, KY: 73 p..
Iron chloride (FeCl3)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1E+07	NR	NR	ug/L	LAB	1972. Terhaar, C.J., W.S. Ewell, S.P. Dziuba, and D.W. Fassett. Toxicity of Photographic Processing Chemicals to Fish. Photogr. Sci. Eng.16(5): 370-377.
Iron chloride (FeCl3)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Iron chloride (FeCl3)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Iron chloride (FeCl3)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Sulfuric acid, Iron (2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Sulfuric acid, Iron (2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	1000000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Sulfuric acid, Iron (2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Sulfuric acid, Iron (2+) salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Sulfuric acid, Iron (2+) salt (1:1)	Green Swordtail	Fish	Fresh	Growth	NR		T	50	NA	NR	mg	LAB	1966. Roeder, M., and R.H. Roeder. Effect of Iron on the Growth Rate of Fishes. J. Nutr.90: 86-90.
Nitric acid, Iron(3+) salt	Green Swordtail	Fish	Fresh	Growth	NR		T	100	NA	NR	mg	LAB	1966. Roeder, M., and R.H. Roeder. Effect of Iron on the Growth Rate of Fishes. J. Nutr.90: 86-90.
Iron chloride (FeCl3)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	117180*	NA	NR	ug/L	LAB	1979. Furmanska, M.. Studies of the Effect of Copper, Zinc, and Iron on the Biotic Components of Aquatic Ecosystems. Pol. Arch. Hydrobiol.26(1-2): 213-220.
Sulfuric acid, Iron (2+) salt (1:1)	Japanese Eel	Fish	NR	Mortality	LD50	Not Reported	D	180000	NA	NR	ug/L	LAB	1987. Nakai, T., T. Kanno, E.R. Cruz, and K. Muroga. The Effects of Iron Compounds on the Virulence of Vibrio anguillarum in Japanese Eels and Ayu. Fish Pathol. (Gyobyo Kenkyu)22(4): 185-189.
Sulfuric acid, Iron (2+) salt (1:1)	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Sulfuric acid, Iron (2+) salt (1:1)	Largemouth Bass	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.
Sulfuric acid, Iron (2+) salt (1:1)	Largemouth Bass	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	50000	NA	NR	ug/L	LAB	1945. Sanborn, N.H.. The Lethal Effect of Certain Chemicals on Fresh Water Fish. The Canning Trade16(27): 10,12-15,26.

Table C-13. Summary of Results from the EcoTox Database for Fish - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron chloride	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	18500	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Iron chloride	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	18500	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Iron chloride	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	18500	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Iron chloride	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	18500	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Iron chloride	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	18500	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Iron chloride	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	26000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Iron chloride	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	26001	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Iron chloride (FeCl3)	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	N	LAB	1927. Carpenter, K.E.. The Lethal Action of Soluble Metallic Salts on Fishes. Br. J. Exp. Biol.4: 378-391.
Sulfuric acid, Iron (2+) salt (1:1)	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	N	LAB	1927. Carpenter, K.E.. The Lethal Action of Soluble Metallic Salts on Fishes. Br. J. Exp. Biol.4: 378-391.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	LOEC	Not Reported	T	40180	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	LOEC	Not Reported	T	50225	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	LOEC	Whole Organism	T	60270	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	LOEC	Whole Organism	T	100450	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	10045	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	40180	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	40180	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	80360	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	NR	Whole Organism	T	10045	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	NR	Whole Organism	T	30135	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	33000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Iron (2+) salt (1:1)	ozambique Tilap	Fish	Fresh	Mortality	LC50	Not Reported	T	47000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Iron (2+) salt (1:1)	ozambique Tilap	Fish	Fresh	Mortality	LC50	Not Reported	T	48000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Iron (2+) salt (1:1)	ozambique Tilap	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	ozambique Tilap	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	ozambique Tilap	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	ozambique Tilap	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	ozambique Tilap	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	80360	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.

Table C-13. Summary of Results from the EcoTox Database for Fish - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Iron (2+) salt (1:1)	ozambique Tilap	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	80360	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	110490	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	ozambique Tilap	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	110495	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Reproduction	LOEC	Not Reported	T	10045	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Reproduction	LOEC	Not Reported	T	10045	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron (2+) salt (1:1)	Mozambique Tilapia	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1982. Mukhopadhyay, M.K., and S.K. Konar. Lethal Effects of Iron on Fish and Aquatic Ecosystem. Indian Assoc. Water Pollut. Contr. Tech. Annu.9: 149-162.
Sulfuric acid, Iron(3+) salt (3:2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	54770		NR	ug/L	LAB	1982. Beleau, M.H., and J.A. Bartosz. Colorado River Fisheries Project Acute Toxicity of Selected Chemicals: Data Base. In: Rep.No.6,Dep.of Fish.Resour.,Univ.of Idaho,Moscow,ID: 243-254.
Sulfuric acid, Iron(3+) salt (3:2)	Northern Squawfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000		NR	ug/L	LAB	1982. Beleau, M.H., and J.A. Bartosz. Colorado River Fisheries Project Acute Toxicity of Selected Chemicals: Data Base. In: Rep.No.6,Dep.of Fish.Resour.,Univ.of Idaho,Moscow,ID: 243-254.
Sulfuric acid, Iron(3+) salt (3:2)	Northern Squawfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	30000		NR	ug/L	LAB	1982. Beleau, M.H., and J.A. Bartosz. Colorado River Fisheries Project Acute Toxicity of Selected Chemicals: Data Base. In: Rep.No.6,Dep.of Fish.Resour.,Univ.of Idaho,Moscow,ID: 243-254.
Iron	Pollan, Whitefish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	630	D	400	ug/L	LAB	1999. Lappivaara, J., A. Kiviniemi, and A. Oikari. Bioaccumulation and Subchronic Physiological Effects of Waterborne Iron Overload on Whitefish Exposed in Humic and Nonhumic Water. Arch. Environ. Contam. Toxicol.37(2): 196-204.
Iron	Pollan, Whitefish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	750	D	200	ug/L	LAB	1999. Lappivaara, J., A. Kiviniemi, and A. Oikari. Bioaccumulation and Subchronic Physiological Effects of Waterborne Iron Overload on Whitefish Exposed in Humic and Nonhumic Water. Arch. Environ. Contam. Toxicol.37(2): 196-204.
Iron	Pollan, Whitefish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2620	D	150	ug/L	LAB	1999. Lappivaara, J., A. Kiviniemi, and A. Oikari. Bioaccumulation and Subchronic Physiological Effects of Waterborne Iron Overload on Whitefish Exposed in Humic and Nonhumic Water. Arch. Environ. Contam. Toxicol.37(2): 196-204.
Sulfuric acid, Iron(2+) salt (1:1), Heptahydrate	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	20800	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Lignosulfonic acid, Chromium iron salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	1500000	NA	NR	ug/L	LAB	1979. Sprague, J.B., and W.J. Logan. Separate and Joint Toxicity to Rainbow Trout of Substances Used in Drilling Fluids for Oil Exploration. Environ. Pollut.19(4): 269-281.
Lignosulfonic acid, Chromium iron salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	1530000	NA	NR	ug/L	LAB	1973. Falk, M.R., and M.J. Lawrence. Acute Toxicity of Petrochemical Drilling Fluids Components and Wastes to Fish. Tech.Rep.Ser.No.CEN T-73-1, Can.Dep.of the Environ., Fish.and Mar.Serv.Resour.Manag.Branch, Winnipeg, Manitoba, Canada: 112 p..
Iron chloride (FeCl3)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	3400000	NA	NR	ug/L	LAB	1977. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-12, DNR, Denver, CO: 68.
Iron chloride (FeCl3)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2200000	NA	NR	ug/L	LAB	1977. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-12, DNR, Denver, CO: 68.
Iron chloride (FeCl3)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3400000	NA	NR	ug/L	LAB	1977. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-12, DNR, Denver, CO: 68.
Iron chloride	Rainbow Trout	Fish	Fresh	Reproduction	NR		T	80	NA	NR	ug/L	LAB	1985. Billard, R., and P. Roubaud. The Effect of Metals and Cyanide on Fertilization in Rainbow Trout (Salmo gairdneri). Water Res.19(2): 209-214.
Iron chloride	Rainbow Trout	Fish	Fresh	Reproduction	NR		T	730	NA	NR	ug/L	LAB	1985. Billard, R., and P. Roubaud. The Effect of Metals and Cyanide on Fertilization in Rainbow Trout (Salmo gairdneri). Water Res.19(2): 209-214.
Iron chloride	Rainbow Trout	Fish	Fresh	Reproduction	NR		T	730	NA	NR	ug/L	LAB	1985. Billard, R., and P. Roubaud. The Effect of Metals and Cyanide on Fertilization in Rainbow Trout (Salmo gairdneri). Water Res.19(2): 209-214.
Sulfuric acid, Iron (2+) salt (1:1)	Southern Platyfish	Fish	Fresh	Growth	NR		T	100	NA	NR	mg	LAB	1966. Roeder, M., and R.H. Roeder. Effect of Iron on the Growth Rate of Fishes. J. Nutr.90: 86-90.
Iron chloride	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Iron chloride	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Iron chloride	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..

Table C-13. Summary of Results from the EcoTox Database for Fish - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Iron chloride	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Iron chloride	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Iron chloride	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Iron chloride	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Iron chloride	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	1000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	1200	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	1500	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	2000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	3000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	5000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	7000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	15000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	20000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	40000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	60000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Iron chloride (FeCl3)	Threespine Stickleback	Fish	Fresh	Mortality	LC100	Not Reported	T	100000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Sulfuric acid, Iron (2+) salt (1:1)	estern Mosquitof	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Sulfuric acid, Iron (2+) salt (1:1)	estern Mosquitof	Fish	Fresh	Mortality	LC50	Not Reported	T	34000	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Iron chloride (FeCl3)	estern Mosquitof	Fish	Fresh	Mortality	LC50*	Not Reported	T	26000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Iron chloride (FeCl3)	estern Mosquitof	Fish	Fresh	Mortality	LC50*	Not Reported	T	26000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Iron chloride (FeCl3)	estern Mosquitof	Fish	Fresh	Mortality	LC50*	Not Reported	T	26000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Sulfuric acid, Iron(3+) salt (3:2)	estern Mosquitof	Fish	Fresh	Mortality	LC50*	Not Reported	T	37200*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Sulfuric acid, Iron(3+) salt (3:2)	estern Mosquitof	Fish	Fresh	Mortality	LC50*	Not Reported	T	37200*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Sulfuric acid, Iron(3+) salt (3:2)	estern Mosquitof	Fish	Fresh	Mortality	LC50*	Not Reported	T	37200*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Iron chloride (FeCl3)	estern Mosquitof	Fish	Fresh	Mortality	NR	Not Reported	T	19000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Sulfuric acid, Iron(3+) salt (3:2)	estern Mosquitof	Fish	Fresh	Mortality	NR	Not Reported	T	28000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Sulfuric acid, Iron (2+) salt (1:1)	Zambezi Barbel	Fish	Fresh	Growth	NR	Not Reported	T	6354400	NA	NR	ug/L	LAB	1997. Baker, R.T.M., P. Martin, and S.J. Davies. Ingestion of Sub-lethal Levels of Iron Sulphate by African Catfish Affects Growth and Tissue Lipid Peroxidation. Aquat. Toxicol.40(1): 51-61.
Iron	Zambezi Barbel	Fish	Fresh	Mortality	NR	Not Reported	T	12000	NR	NR	ug/L	LAB	2006. Wegwu, M.O., and J.O. Akaninwor. Assessment of Heavy-Metal Profile of the New Calabar River and Its Impact on Juvenile Clarias gariepinus. Chem. Biodivers.3(1): 79-87.

Table C-13. Summary of Results from the EcoTox Database for Fish - Iron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Iron (2+) salt (1:1)	Zander	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1975. Stangenberg, M.. The Influence of the Chemical Composition of Water on the Pike Perch (Lucioperca lucioperca L.) Fry from the Lake Gopio. Limnologica9(3): 421-426.
Sulfuric acid, Iron (2+) salt (1:1)	Zebra Danio	Fish	Fresh	Growth	NR	Whole Organism	T	560000	NR	NR	ug/L	LAB	2009. Craig, P.M., M. Galus, C.M. Wood, and G.B. McClelland. Dietary Iron Alters Waterborne Copper-Induced Gene Expression in Soft Water Acclimated Zebrafish (Danio rerio). Am. J. Physiol., Regul. Integr. Comp. Physiol.296(2): R362 - R373.
Iron chloride (FeCl3)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	32000	NA	NR	ug/L	LAB	1985. Dave, G.. The Influence of pH on the Toxicity of Aluminum, Cadmium, and Iron to Eggs and Larvae of the Zebrafish, Brachydanio rerio. Ecotoxicol. Environ. Saf.10(2): 253-267.
Sulfuric acid, Iron (2+) salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	560000	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to *Hyalella azteca* at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Nitric acid, Lead (2+) salt	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1983. Grande, M., and S. Andersen. Lethal Effects of Hexavalent Chromium, Lead and Nickel on Young Stages of Atlantic Salmon (Salmo salar L.) in Soft Water. Vatten39(4): 405-416.
Nitric acid, Lead (2+) salt	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1983. Grande, M., and S. Andersen. Lethal Effects of Hexavalent Chromium, Lead and Nickel on Young Stages of Atlantic Salmon (Salmo salar L.) in Soft Water. Vatten39(4): 405-416.
Nitric acid, Lead (2+) salt	Atlantic Salmon	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Grande, M., and S. Andersen. Lethal Effects of Hexavalent Chromium, Lead and Nickel on Young Stages of Atlantic Salmon (Salmo salar L.) in Soft Water. Vatten39(4): 405-416.
Nitric acid, Lead (2+) salt	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Grande, M., and S. Andersen. Lethal Effects of Hexavalent Chromium, Lead and Nickel on Young Stages of Atlantic Salmon (Salmo salar L.) in Soft Water. Vatten39(4): 405-416.
Nitric acid, Lead (2+) salt	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	400000*	NA	NR	ug/L	LAB	1984. Bengeri, K.V., and H.S. Patil. Acute Toxicity of Lead Nitrate and Lead Acetate to a Fresh Water Fish Barbus aurilus and Their Effect on Oxygen Uptake. Bull. Pure Appl. Sci. 3A(1): 9-13.
Nitric acid, Lead (2+) salt	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	NA	NR	ug/L	LAB	1954. Turnbull, H., J.G. Demann, and R.F. Weston. Toxicity of Various Refinery Materials to Fresh Water Fish. J. Ind. Eng. Chem.46(2): 324-333.
Nitric acid, Lead (2+) salt	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	NA	NR	ug/L	LAB	1954. Turnbull, H., J.G. Demann, and R.F. Weston. Toxicity of Various Refinery Materials to Fresh Water Fish. J. Ind. Eng. Chem.46(2): 324-333.
Lead chloride (PbCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	23800	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	24500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	25900	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	442000	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	468000	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	482000	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nitric acid, Lead (2+) salt	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	70	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Nitric acid, Lead (2+) salt	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	120	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Nitric acid, Lead (2+) salt	Bonytail	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	170000	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Nitric acid, Lead (2+) salt	Bonytail	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	170000	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	MATC	Not Reported	T	NR	D	NR	ug/L	LAB	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard, and J.M. McKim. Long-Term Effects of Lead Exposure on Three Generations of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.33(8): 1731-1741.
Lead	Brook Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	3200	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Lead	Brook Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	3400	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	T	58	NA	NR	ug/L	LAB	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard, and J.M. McKim. Long-Term Effects of Lead Exposure on Three Generations of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.33(8): 1731-1741.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	T	119	NA	NR	ug/L	LAB	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard, and J.M. McKim. Long-Term Effects of Lead Exposure on Three Generations of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.33(8): 1731-1741.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR		T	134	NA	NR	ug/L	LAB	1975. Christensen, G.M.. Biochemical Effects of Methylmercuric Chloride, Cadmium Chloride, and Lead Nitrate on Embryos and Alevins of the Brook Trout, Salvelinus fontinalis. Toxicol. Appl. Pharmacol.32: 191-197.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	T	474	NA	NR	ug/L	LAB	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard, and J.M. McKim. Long-Term Effects of Lead Exposure on Three Generations of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.33(8): 1731-1741.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	10000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	10000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	10000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	15000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	15000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	15000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	15000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	15000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	15000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	15000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	15000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	15000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	25000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	25000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	25000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	25000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	25000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	25000	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Lead	Brook Trout	Fish	Fresh	Mortality	IC50	Not Reported	T	1200	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3120	NR	NR	ug/L	LAB	1969. Dorfman, D., and W.R. Whitworth. Effects of Fluctuations of Lead, Temperature, and Dissolved Oxygen on the Growth of Brook Trout. J. Fish. Res. Board Can.26(9): 2493-2501.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4100	NA	NR	ug/L	LAB	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard, and J.M. McKim. Long-Term Effects of Lead Exposure on Three Generations of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.33(8): 1731-1741.
Lead	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	3200	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Lead	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	3400	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead	Brook Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	2332	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Lead	Brook Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	2608	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1987. Tang, Y., and E.T. Garside. Preexposure and Subsequent Resistance to Lead in Yearling Brook Trout, Salvelinus fontinalis. Can. J. Fish. Aquat. Sci.44(5): 1089-1091.
Lead	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1700	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Lead	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	2000	NR	NR	ug/L	LAB	1995. Jop, K.M., A.M. Askew, and R.B. Foster. Development of a Water-Effect Ratio for Copper, Cadmium, and Lead for the Great Works River in Maine Using Ceriodaphnia dubia and Salvelinus fontinalis. Bull. Environ. Contam. Toxicol.54(1): 29-35.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	119	NA	NR	ug/L	LAB	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard, and J.M. McKim. Long-Term Effects of Lead Exposure on Three Generations of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.33(8): 1731-1741.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	474	NA	NR	ug/L	LAB	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard, and J.M. McKim. Long-Term Effects of Lead Exposure on Three Generations of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.33(8): 1731-1741.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	474.8	NA	NR	ug/L	LAB	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard, and J.M. McKim. Long-Term Effects of Lead Exposure on Three Generations of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.33(8): 1731-1741.
Lead chloride (PbCl2)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Reproduction	NR	Not Reported	T	235	NA	NR	ug/L	LAB	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard, and J.M. McKim. Long-Term Effects of Lead Exposure on Three Generations of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.33(8): 1731-1741.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Reproduction	NR	Not Reported	T	474	NA	NR	ug/L	LAB	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard, and J.M. McKim. Long-Term Effects of Lead Exposure on Three Generations of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.33(8): 1731-1741.
Nitric acid, Lead (2+) salt	Brook Trout	Fish	Fresh	Reproduction	NR	Not Reported	T	474.8	NA	NR	ug/L	LAB	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard, and J.M. McKim. Long-Term Effects of Lead Exposure on Three Generations of Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.33(8): 1731-1741.
Nitric acid, Lead (2+) salt	Brown Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1981. O'Neill, J.G.. Effects of Intraperitoneal Lead and Cadmium on the Humoral Immune Response of Salmo trutta. Bull. Environ. Contam. Toxicol.27(1): 42-48.
Nitric acid, Lead (2+) salt	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	53	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Embryonic and Larval Development of Brown Trout, Salmo trutta L.: Exposure to Trace Metal Mixtures in Soft Water. J. Fish Biol.38: 773-787.
Nitric acid, Lead (2+) salt	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	nmol/L	LAB	1989. Sayer, M.D.J., J.P. Reader, and R. Morris. The Effect of Calcium Concentration on the Toxicity of Copper, Lead and Zinc to Yolk-Sac Fry of Brown Trout, Salmo trutta L., in Soft, Acid Water. J. Fish Biol.35(3): 323-332.
Nitric acid, Lead (2+) salt	Brown Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NR	NR	ug/L	LAB	1981. O'Neill, J.G.. Effects of Intraperitoneal Lead and Cadmium on the Humoral Immune Response of Salmo trutta. Bull. Environ. Contam. Toxicol.27(1): 42-48.
Nitric acid, Lead (2+) salt	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	225	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Effects of Six Trace Metals on Calcium Fluxes in Brown Trout (Salmo trutta L.) in Soft Water. J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.: 537-542.
Nitric acid, Lead (2+) salt	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NR	NR	ug/L	LAB	1981. O'Neill, J.G.. Effects of Intraperitoneal Lead and Cadmium on the Humoral Immune Response of Salmo trutta. Bull. Environ. Contam. Toxicol.27(1): 42-48.
Nitric acid, Lead (2+) salt	Brown Trout	Fish	Fresh	Reproduction	LOEC	Sperm	T	3000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nitric acid, Lead (2+) salt	Brown Trout	Fish	Fresh	Reproduction	NOEC	Sperm	T	3000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nitric acid, Lead (2+) salt	Brown Trout	Fish	Fresh	Reproduction	NOEC	Sperm	T	3000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nitric acid, Lead (2+) salt	Burbot	Fish	Fresh	Reproduction	LOEC	Sperm	T	300000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nitric acid, Lead (2+) salt	Burbot	Fish	Fresh	Reproduction	LOEC	Sperm	T	300000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nitric acid, Lead (2+) salt	Burbot	Fish	Fresh	Reproduction	NOEC	Sperm	T	300000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	8200	D	1350	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	15600	D	3530	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	162000	D	1190	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	341000	D	1780	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	357000	D	910	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	414000	D	1580	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	427000	D	570	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	439000	D	390	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	554000	D	1400	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	632000	D	240	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	632000	D	1890	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	664000	D	1440	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1291000	D	1470	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1356000	D	1410	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1720	NA	NR	ug/L	LAB	1989. Oladimeji, A.A., and B.O. Offem. Toxicity of Lead to Clarias lazera, Oreochromis niloticus, Chironomus tentans and Benacus sp. Water Air Soil Pollut.44(3): 191-201.
Nitric acid, Lead (2+) salt	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1910	NA	NR	ug/L	LAB	1989. Oladimeji, A.A., and B.O. Offem. Toxicity of Lead to Clarias lazera, Oreochromis niloticus, Chironomus tentans and Benacus sp. Water Air Soil Pollut.44(3): 191-201.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	5300	D	1040	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	D	2210	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	91000	D	970	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	136000	D	1450	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	201000	D	1240	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	213000	D	580	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	248000	D	260	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	273000	D	1460	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	285000	D	1140	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	299000	D	170	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	306000	D	1260	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	355000	D	90	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	865000	D	1180	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	874000	D	1090	ug/L	LAB	2003. Datta, S., and R.C. Das. Influence of Some Abiotic Environmental Factors on Acute Toxicity of Inorganic Lead to Cyprinus carpio var communis (Linn.) and Catla catla (Ham.) in Simulated Toxic Aquatic Environment. Toxicol. Environ. Chem.85(4-6): 203-219.
Nitric acid, Lead (2+) salt	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	75	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Nitric acid, Lead (2+) salt	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	136	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Nitric acid, Lead (2+) salt	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	2150*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Nitric acid, Lead (2+) salt	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	600*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Nitric acid, Lead (2+) salt	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	6300*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Nitric acid, Lead (2+) salt	Chub	Fish	Fresh	Reproduction	LOEC	Sperm	T	30000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nitric acid, Lead (2+) salt	Chub	Fish	Fresh	Reproduction	NOEC	Sperm	T	30000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nitric acid, Lead (2+) salt	Chub	Fish	Fresh	Reproduction	NOEC	Sperm	T	30000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nitric acid, Lead (2+) salt	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	40000	NA	NR	ug/L	LAB	1996. Chandravathy, V.M., and S.L.N. Reddy. Lead Nitrate Exposure Changes in Carbohydrate Metabolism of Freshwater Fish. J. Environ. Biol.17(1): 75-79.
Nitric acid, Lead (2+) salt	Climbing Perch	Fish	Fresh	Reproduction	NR		T	1250	NA	NR	ug/L	LAB	1989. Tulasi, S.J., P.U.M. Reddy, and J.V. Ramana Rao. Effects of Lead on the Spawning Potential of the Fresh Water Fish, Anabas testudineus. Bull. Environ. Contam. Toxicol.43(6): 858-863.
Lead chloride (PbCl2)	Salmon,Silver S	Fish	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Nitric acid, Lead (2+) salt	Salmon,Silver S	Fish	Fresh	Mortality	LC50	Not Reported	T	4180	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Nitric acid, Lead (2+) salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Nitric acid, Lead (2+) salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	21700	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Nitric acid, Lead (2+) salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	6300*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Nitric acid, Lead (2+) salt	Colorado Squawfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	170000	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Colorado Squawfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	170000	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	LC0	Not Reported	T	20000	NA	NR	ug/L	LAB	1980. Muramoto, S.. Effect of Complexans (EDTA, NTA and DTPA) on the Exposure to high Concentrations of Cadmium, Copper, Zinc and Lead. Bull. Environ. Contam. Toxicol.25(6): 941-946.
Lead	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	440	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	440	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Lead	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	800	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Lead	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1330	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1330	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NR	NR	ug/L	LAB	1997. Gopal, V., S. Parvathy, and P.R. Balasubramanian. Effect of Heavy Metals on the Blood Protein Biochemistry of the Fish Cyprinus carpio and Its Use as a Bio-Indicator of Pollution Stress. Environ. Monit. Assess.48: 117-124.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	28330	NR	NR	ug/L	LAB	1997. Mathew, R., M.K. Kanangaraj, and R. Manavalaramanujam. Lead Nitrate Toxicity on Ventilation Frequency, Oxygen Consumption and Haemoglobin Content in Fish, Cyprinus carpio. Pollut. Res.16(1): 51-53.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	170*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	240*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	310*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	0.96	NA	NR	umol/L	LAB	1994. Stouthart, J.H.X., F.A.T. Spanings, R.A.C. Lock, and S.E. Wendelaar Bonga. Effects of Low Water pH on Lead Toxicity to Early Life Stages of the Common Carp (Cyprinus carpio). Aquat. Toxicol.30(2): 137-151.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1994. Stouthart, J.H.X., F.A.T. Spanings, R.A.C. Lock, and S.E. Wendelaar Bonga. Effects of Low Water pH on Lead Toxicity to Early Life Stages of the Common Carp (Cyprinus carpio). Aquat. Toxicol.30(2): 137-151.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1994. Stouthart, J.H.X., F.A.T. Spanings, R.A.C. Lock, and S.E. Wendelaar Bonga. Effects of Low Water pH on Lead Toxicity to Early Life Stages of the Common Carp (Cyprinus carpio). Aquat. Toxicol.30(2): 137-151.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1994. Stouthart, J.H.X., F.A.T. Spanings, R.A.C. Lock, and S.E. Wendelaar Bonga. Effects of Low Water pH on Lead Toxicity to Early Life Stages of the Common Carp (Cyprinus carpio). Aquat. Toxicol.30(2): 137-151.
Nitric acid, Lead (2+) salt	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	25	NR	NR	ug/L	LAB	1993. Kralj-Klobucar, N.. Lead Intake in the Juvenile and Adult Carp (Cyprinus carpio L.). Vet. Arh. (Tisak)63(2): 95-105.
Lead	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1500	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Lead	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Lead	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nitric acid, Lead (2+) salt	Common Shiner	Fish	NR	Mortality	NR	Not Reported	T	NR	NR	NR	M	NR	1930. Carpenter, K.E.. Further Researches on the Action of Metallic Salts on Fishes. J. Exp. Zool.56(4): 407-422.
Nitric acid, Lead (2+) salt	Danio	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	T	16200	NR	NR	ug/L	LAB	1994. Singh, B.K., and S.P. Singh. Toxic Effects of Some Inorganic Salts on Testes of Fresh Water Fish Danio equipinatus (HAM). Proc. Acad. Environ. Biol.3(2): 241-244.
Nitric acid, Lead (2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	113.8	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	130.3	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	283	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	610	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	810	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nitric acid, Lead (2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Nitric acid, Lead (2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2484	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2760	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2760	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, Lead (2+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2913	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Lead(II) sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6240	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	12500		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	12500	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Lead(II) sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	60800	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Lead(II) sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	148000		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Lead(II) sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	148000	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2723000	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2918000	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Lead(II) sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3221000		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Lead(II) sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3221000	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	3333000	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3414000		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3414000	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Lead(II) sulfate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3431000	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	2400	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	5580	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	5990	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	7330	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	8180	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	11500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	11500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	482000	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	482000	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	482000	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nitric acid, Lead (2+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Lead chloride (PbCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1976. Cardwell, R.D., D.G. Foreman, T.R. Payne, and D.J. Wilbur. Acute Toxicity of Selected Toxicants to Six Species of Fish. EPA-600/3-76-008, U.S.EPA, Duluth, MN: 125 p..
Nitric acid, Lead (2+) salt	Giant Gourami	Fish	Fresh	Mortality	NR	Not Reported	T	9500*	NA	NR	ug/L	LAB	1987. Srivastava, A.K.. Changes Induced by Lead in Fish Testis. J. Environ. Biol.8(4): 329-332.
Nitric acid, Lead (2+) salt	Gibel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	NR	NR	NR	ug/L	LAB	1997. Nakagawa, H., T. Tajima, T. Sato, and M. Watanabe. Evaluation of Erythrocyte 5-Aminolevulinic Acid Dehydratase Activity in the Blood of Crucian Carp, Carassius auratus langsdorfii, as an Indicator in Fish of Water Lead Pollution. J. Fac. Agric. Kyushu Univ.41(3-4): 205-213.
Nitric acid, Lead (2+) salt	Gibel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	NR	NR	NR	ug/L	LAB	1997. Nakagawa, H., T. Tajima, T. Sato, and M. Watanabe. Evaluation of Erythrocyte 5-Aminolevulinic Acid Dehydratase Activity in the Blood of Crucian Carp, Carassius auratus langsdorfii, as an Indicator in Fish of Water Lead Pollution. J. Fac. Agric. Kyushu Univ.41(3-4): 205-213.
Nitric acid, Lead (2+) salt	Gibel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	NR	NR	NR	ug/L	LAB	1997. Nakagawa, H., T. Tajima, T. Sato, and M. Watanabe. Evaluation of Erythrocyte 5-Aminolevulinic Acid Dehydratase Activity in the Blood of Crucian Carp, Carassius auratus langsdorfii, as an Indicator in Fish of Water Lead Pollution. J. Fac. Agric. Kyushu Univ.41(3-4): 205-213.
Nitric acid, Lead (2+) salt	Goldfish	Fish	Fresh	Growth	NR	Not Reported	T	0.0005	NR	NR	%	LAB	1926. Dilling, W.J., C.W. Healey, and W.C. Smith. Experiments on the Effects of Lead on the Growth of Plaice (Pleuronectes platessa). Ann. Appl. Biol.13: 168-176.
Lead	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1660	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Lead chloride (PbCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1660	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Nitric acid, Lead (2+) salt	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	6600	NA	NR	ug/L	LAB	1970. Weir, P.A., and C.H. Hine. Effects of Various Metals on Behavior of Conditioned Goldfish. Arch. Environ. Health20(1): 45-51.
Nitric acid, Lead (2+) salt	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	D	37000	NA	NR	ug/L	LAB	1975. Lautenbacher, H.W.. Development and Application of Analytical Methods for the Study of Biological Changes in Goldfish Exposed to Sub-lethal Concentrations of Nitrilotria. Ph.D.Thesis, Temple University:174 p., Diss.Abstr.Int.B Sci.Eng.36(6): 2693.
Lead	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	D	40000	NA	NR	ug/L	LAB	1992. Bolognani Fantin, A.M., A. Franchini, P. Trevisan, and A. Pederzoli. Histomorphological and Cytochemical Changes Induced in the Liver of Goldfish Carassius carassius var. auratus by Short-Term Exposure to Lead. Acta Histochem.92(2): 228-235.
Nitric acid, Lead (2+) salt	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	D	59000	NA	NR	ug/L	LAB	1975. Lautenbacher, H.W.. Development and Application of Analytical Methods for the Study of Biological Changes in Goldfish Exposed to Sub-lethal Concentrations of Nitrilotria. Ph.D.Thesis, Temple University:174 p., Diss.Abstr.Int.B Sci.Eng.36(6): 2693.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	110000	NA	NR	ug/L	LAB	1970. Weir, P.A., and C.H. Hine. Effects of Various Metals on Behavior of Conditioned Goldfish. Arch. Environ. Health20(1): 45-51.
Lead chloride (PbCl2)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	31500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	31500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	45400	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	0.00167	NR	NR	%	LAB	1926. Dilling, W.J., C.W. Healey, and W.C. Smith. Experiments on the Effects of Lead on the Growth of Plaice (Pleuronectes platessa). Ann. Appl. Biol.13: 168-176.
Nitric acid, Lead (2+) salt	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	0.00167	NR	NR	%	LAB	1926. Dilling, W.J., C.W. Healey, and W.C. Smith. Experiments on the Effects of Lead on the Growth of Plaice (Pleuronectes platessa). Ann. Appl. Biol.13: 168-176.
Lead(II) sulfate	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	D	2500	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	1000000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Lead	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	%	LAB	1926. Dilling, W.J., C.W. Healey, and W.C. Smith. Experiments on the Effects of Lead on the Growth of Plaice (Pleuronectes platessa). Ann. Appl. Biol.13: 168-176.
Lead	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	%	LAB	1926. Dilling, W.J., C.W. Healey, and W.C. Smith. Experiments on the Effects of Lead on the Growth of Plaice (Pleuronectes platessa). Ann. Appl. Biol.13: 168-176.
Nitric acid, Lead (2+) salt	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	%	LAB	1926. Dilling, W.J., C.W. Healey, and W.C. Smith. Experiments on the Effects of Lead on the Growth of Plaice (Pleuronectes platessa). Ann. Appl. Biol.13: 168-176.
Nitric acid, Lead (2+) salt	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	0.005	NR	NR	%	LAB	1926. Dilling, W.J., C.W. Healey, and W.C. Smith. Experiments on the Effects of Lead on the Growth of Plaice (Pleuronectes platessa). Ann. Appl. Biol.13: 168-176.
Lead(II) sulfate	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	25000	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Lead	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250000	NA	NR	ug/L	LAB	1996. Coello, W.F., and M.A.Q. Khan. Protection Against Heavy Metal Toxicity by Mucus and Scales in Fish. Arch. Environ. Contam. Toxicol.30: 319-326.
Nitric acid, Lead (2+) salt	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250000	NA	NR	ug/L	LAB	1996. Coello, W.F., and M.A.Q. Khan. Protection Against Heavy Metal Toxicity by Mucus and Scales in Fish. Arch. Environ. Contam. Toxicol.30: 319-326.
Nitric acid, Lead (2+) salt	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	250000	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Lead	ss Carp, White A	Fish	Fresh	Growth	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1990. Mao, S., and C. Wang. The Effect of Some Pollutants on SCE of Grass Carp (Ctenopharyngodon idellus) Cells. Oceanol. Limnol. Sin. /Haiyang Yu Huzhao21(3): 205-211.
Nitric acid, Lead (2+) salt	ss Carp, White A	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.
Lead	Green Sunfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250000	NA	NR	ug/L	LAB	1996. Coello, W.F., and M.A.Q. Khan. Protection Against Heavy Metal Toxicity by Mucus and Scales in Fish. Arch. Environ. Contam. Toxicol.30: 319-326.
Nitric acid, Lead (2+) salt	Green Sunfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250000	NA	NR	ug/L	LAB	1996. Coello, W.F., and M.A.Q. Khan. Protection Against Heavy Metal Toxicity by Mucus and Scales in Fish. Arch. Environ. Contam. Toxicol.30: 319-326.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Growth	NR	Whole Organism	T	1240	NR	NR	ug/L	LAB	1962. Crandall, C.A., and C.J. Goodnight. Effects of Sublethal Concentrations of Several Toxicants on Growth of the Common Guppy, Lebistes reticulatus. Limnol. Oceanogr.7(2): 233-239.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	7300	NR	NR	ug/L	LAB	1983. Gadkari, A.S., and V.B. Marathe. Toxicity of Cadmium and Lead to a Fish and a Snail from Two Different Habitats. Indian Assoc. Water Pollut. Control Tech. Annu.5: 141-148.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	12500	NR	NR	ug/L	LAB	1983. Gadkari, A.S., and V.B. Marathe. Toxicity of Cadmium and Lead to a Fish and a Snail from Two Different Habitats. Indian Assoc. Water Pollut. Control Tech. Annu.5: 141-148.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	15500	NR	NR	ug/L	LAB	1983. Gadkari, A.S., and V.B. Marathe. Toxicity of Cadmium and Lead to a Fish and a Snail from Two Different Habitats. Indian Assoc. Water Pollut. Control Tech. Annu.5: 141-148.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1625000	NA	NR	ug/L	LAB	1987. Sehgal, R., and A.B. Saxena. Determination of Acute Toxicity Levels of Cadmium and Lead to the Fish Lebistes reticulatus (Peters). Int. J. Environ. Stud.29: 157-161.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1630000	NA	NR	ug/L	LAB	1987. Sehgal, R., and A.B. Saxena. Determination of Acute Toxicity Levels of Cadmium and Lead to the Fish Lebistes reticulatus (Peters). Int. J. Environ. Stud.29: 157-161.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1632000	NA	NR	ug/L	LAB	1987. Sehgal, R., and A.B. Saxena. Determination of Acute Toxicity Levels of Cadmium and Lead to the Fish Lebistes reticulatus (Peters). Int. J. Environ. Stud.29: 157-161.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1640000	NA	NR	ug/L	LAB	1987. Sehgal, R., and A.B. Saxena. Determination of Acute Toxicity Levels of Cadmium and Lead to the Fish Lebistes reticulatus (Peters). Int. J. Environ. Stud.29: 157-161.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1645000	NA	NR	ug/L	LAB	1987. Sehgal, R., and A.B. Saxena. Determination of Acute Toxicity Levels of Cadmium and Lead to the Fish Lebistes reticulatus (Peters). Int. J. Environ. Stud.29: 157-161.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1650000	NA	NR	ug/L	LAB	1987. Sehgal, R., and A.B. Saxena. Determination of Acute Toxicity Levels of Cadmium and Lead to the Fish Lebistes reticulatus (Peters). Int. J. Environ. Stud.29: 157-161.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1650000	NA	NR	ug/L	LAB	1987. Sehgal, R., and A.B. Saxena. Determination of Acute Toxicity Levels of Cadmium and Lead to the Fish Lebistes reticulatus (Peters). Int. J. Environ. Stud.29: 157-161.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1675000	NA	NR	ug/L	LAB	1987. Sehgal, R., and A.B. Saxena. Determination of Acute Toxicity Levels of Cadmium and Lead to the Fish Lebistes reticulatus (Peters). Int. J. Environ. Stud.29: 157-161.
Lead chloride (PbCl2)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	20600	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	24500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Lead chloride (PbCl2)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	24500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nitric acid, Lead (2+) salt	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1962. Crandall, C.A., and C.J. Goodnight. Effects of Sublethal Concentrations of Several Toxicants on Growth of the Common Guppy, Lebistes reticulatus. Limnol. Oceanogr.7(2): 233-239.
Nitric acid, Lead (2+) salt	Indian Catfish	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1999. Jain, S.K.. Protective Role of Zeolite on Short- and Long-Term Lead Toxicity in the Teleost Fish Heteropneustes fossilis. Chemosphere39(2): 247-251.
Nitric acid, Lead (2+) salt	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	105000	NR	NR	ug/L	LAB	1999. Jain, S.K.. Protective Role of Zeolite on Short- and Long-Term Lead Toxicity in the Teleost Fish Heteropneustes fossilis. Chemosphere39(2): 247-251.
Nitric acid, Lead (2+) salt	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	D	105000	NR	NR	ug/L	LAB	2000. Shrivastava, S., and S.K. Jain. Zeolite Mediated Lead Accumulation in Fish Tissues. Him. J. Env. Zool.14(1): 65-68.
Nitric acid, Lead (2+) salt	Lake Trout, Siscowet	Fish	Fresh	Mortality	NR	Not Reported	T	48	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Nitric acid, Lead (2+) salt	Lake Trout, Siscowet	Fish	Fresh	Mortality	NR	Not Reported	T	83	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Lead chloride (PbCl2)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Lead	Largemouth Bass	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250000	NA	NR	ug/L	LAB	1996. Coello, W.F., and M.A.Q. Khan. Protection Against Heavy Metal Toxicity by Mucus and Scales in Fish. Arch. Environ. Contam. Toxicol.30: 319-326.
Nitric acid, Lead (2+) salt	Largemouth Bass	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250000	NA	NR	ug/L	LAB	1996. Coello, W.F., and M.A.Q. Khan. Protection Against Heavy Metal Toxicity by Mucus and Scales in Fish. Arch. Environ. Contam. Toxicol.30: 319-326.
Nitric acid, Lead (2+) salt	Little Colorado Spinedace	Fish	Fresh	Reproduction	MATC	Not Reported	T	52	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Nitric acid, Lead (2+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	205000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, Lead (2+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	300000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, Lead (2+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	340000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, Lead (2+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	350000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, Lead (2+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	350000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, Lead (2+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	350000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	0.1	NR	NR	N	LAB	1927. Carpenter, K.E.. The Lethal Action of Soluble Metallic Salts on Fishes. Br. J. Exp. Biol.4: 378-391.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	0.5*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	N	LAB	1927. Carpenter, K.E.. The Lethal Action of Soluble Metallic Salts on Fishes. Br. J. Exp. Biol.4: 378-391.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	N	LAB	1927. Carpenter, K.E.. The Lethal Action of Soluble Metallic Salts on Fishes. Br. J. Exp. Biol.4: 378-391.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	400	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	400	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	400	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	1000	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	1000	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	5000	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	5000	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	10000	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	10000	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	250000	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	250000	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	innow,Carp Fam	Fish	Fresh	Mortality	LC50*	Not Reported	T	1000	NA	NR	ug/L	LAB	1985. Nishihara, T., T. Shimamoto, K.C. Wen, and M. Kondo. Accumulation of Lead, Cadmium and Chromium in Several Organs and Tissues of Carp. J. Hyg. Chem. /Eisei Kagaku31(2): 119-123.
Nitric acid, Lead (2+) salt	innow,Carp Fam	Fish	Fresh	Mortality	LC50*	Not Reported	T	1900	NA	NR	ug/L	LAB	1985. Nishihara, T., T. Shimamoto, K.C. Wen, and M. Kondo. Accumulation of Lead, Cadmium and Chromium in Several Organs and Tissues of Carp. J. Hyg. Chem. /Eisei Kagaku31(2): 119-123.
Nitric acid, Lead (2+) salt	Minnow,Carp Family	Fish	Fresh	Mortality	LC50*	Not Reported	T	2100	NA	NR	ug/L	LAB	1985. Nishihara, T., T. Shimamoto, K.C. Wen, and M. Kondo. Accumulation of Lead, Cadmium and Chromium in Several Organs and Tissues of Carp. J. Hyg. Chem. /Eisei Kagaku31(2): 119-123.
Nitric acid, Lead (2+) salt	Mottled Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	550000	NA	NR	ug/L	LAB	1991. Pundir, R., and A. Sharma. Effect of Lead on the Pituitary and Gonads of a Freshwater Fish, Nemacheilus botia. Funct. Dev. Morphol.1(1): 55-58.
Nitric acid, Lead (2+) salt	Mottled Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	600000	NA	NR	ug/L	LAB	1991. Pundir, R., and A. Sharma. Effect of Lead on the Pituitary and Gonads of a Freshwater Fish, Nemacheilus botia. Funct. Dev. Morphol.1(1): 55-58.
Nitric acid, Lead (2+) salt	Mottled Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	620000	NA	NR	ug/L	LAB	1991. Pundir, R., and A. Sharma. Effect of Lead on the Pituitary and Gonads of a Freshwater Fish, Nemacheilus botia. Funct. Dev. Morphol.1(1): 55-58.
Nitric acid, Lead (2+) salt	Mottled Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	650000	NA	NR	ug/L	LAB	1991. Pundir, R., and A. Sharma. Effect of Lead on the Pituitary and Gonads of a Freshwater Fish, Nemacheilus botia. Funct. Dev. Morphol.1(1): 55-58.
Nitric acid, Lead (2+) salt	Mottled Loach	Fish	Fresh	Reproduction	NR	Ovaries	T	178840	NA	NR	ug/L	LAB	1991. Pundir, R., and A. Sharma. Effect of Lead on the Pituitary and Gonads of a Freshwater Fish, Nemacheilus botia. Funct. Dev. Morphol.1(1): 55-58.
Nitric acid, Lead (2+) salt	Mottled Loach	Fish	Fresh	Reproduction	NR	Testes	T	178840	NA	NR	ug/L	LAB	1991. Pundir, R., and A. Sharma. Effect of Lead on the Pituitary and Gonads of a Freshwater Fish, Nemacheilus botia. Funct. Dev. Morphol.1(1): 55-58.
Nitric acid, Lead (2+) salt	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	94960	NA	NR	ug/L	LAB	1994. James, R., K. Sampath, and S. Alagurathinam. Accumulation and Prediction of Lead Elimination in Oreochromis mossambicus as a Function of Body Size. Acta Hydrobiol.36(1): 115-124.
Nitric acid, Lead (2+) salt	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	104910	NA	NR	ug/L	LAB	1994. James, R., K. Sampath, and S. Alagurathinam. Accumulation and Prediction of Lead Elimination in Oreochromis mossambicus as a Function of Body Size. Acta Hydrobiol.36(1): 115-124.
Nitric acid, Lead (2+) salt	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	104910	NA	NR	ug/L	LAB	1994. James, R., K. Sampath, and S. Alagurathinam. Accumulation and Prediction of Lead Elimination in Oreochromis mossambicus as a Function of Body Size. Acta Hydrobiol.36(1): 115-124.
Nitric acid, Lead (2+) salt	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	104910	NR	NR	ug/L	LAB	1996. James, R., K. Sampath, and S. Alagurathinam. Effects of Lead on Respiratory Enzyme Activity, Glycogen and Blood Sugar Levels of the Teleost Oreochromis mossambicus (Peters) During Accumulation. Asian Fish. Sci.9(2): 87-100.
Nitric acid, Lead (2+) salt	ozambique Tilap	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	155000	NR	NR	ug/L	LAB	1996. James, R., K. Sampath, and S. Alagurathinam. Effects of Lead on Respiratory Enzyme Activity, Glycogen and Blood Sugar Levels of the Teleost Oreochromis mossambicus (Peters) During Accumulation. Asian Fish. Sci.9(2): 87-100.
Nitric acid, Lead (2+) salt	ozambique Tilap	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	30000	NR	NR	ug/L	LAB	1996. James, R., K. Sampath, and S. Alagurathinam. Effects of Lead on Respiratory Enzyme Activity, Glycogen and Blood Sugar Levels of the Teleost Oreochromis mossambicus (Peters) During Accumulation. Asian Fish. Sci.9(2): 87-100.
Nitric acid, Lead (2+) salt	Mummichog	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1900*	NA	NR	ug/L	LAB	1915. Thomas, A.. Effects of Certain Metallic Salts upon Fishes. Trans. Am. Fish. Soc.44: 120-124.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Nile Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	uM	LAB	2008. Atli, G., and M. Canli. Responses of Metallothionein and Reduced Glutathione in a Freshwater Fish Oreochromis niloticus Following Metal Exposures. Environ. Toxicol. Pharmacol.25(1): 33-38.
Nitric acid, Lead (2+) salt	Nile Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	uM	LAB	2008. Atli, G., and M. Canli. Responses of Metallothionein and Reduced Glutathione in a Freshwater Fish Oreochromis niloticus Following Metal Exposures. Environ. Toxicol. Pharmacol.25(1): 33-38.
Nitric acid, Lead (2+) salt	Nile Tilapia	Fish	Fresh	Growth	NOEL	Whole Organism	T	20		NC	uM	LAB	2007. Atli, G., and M. Canli. Enzymatic Responses to Metal Exposures in a Freshwater Fish Oreochromis niloticus. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.145(2): 282-287.
Nitric acid, Lead (2+) salt	Nile Tilapia	Fish	Fresh	Growth	NOEL	Whole Organism	T	20		NC	uM	LAB	2007. Atli, G., and M. Canli. Enzymatic Responses to Metal Exposures in a Freshwater Fish Oreochromis niloticus. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.145(2): 282-287.
Nitric acid, Lead (2+) salt	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	2150	NA	NR	ug/L	LAB	1989. Oladimeji, A.A., and B.O. Offem. Toxicity of Lead to Clarias lazera, Oreochromis niloticus, Chironomus tentans and Benacus sp. Water Air Soil Pollut.44(3): 191-201.
Nitric acid, Lead (2+) salt	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	3340	NA	NR	ug/L	LAB	1989. Oladimeji, A.A., and B.O. Offem. Toxicity of Lead to Clarias lazera, Oreochromis niloticus, Chironomus tentans and Benacus sp. Water Air Soil Pollut.44(3): 191-201.
Nitric acid, Lead (2+) salt	Northern Pike	Fish	Fresh	Mortality	NR	Not Reported	T	253	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Nitric acid, Lead (2+) salt	Northern Pike	Fish	Fresh	Mortality	NR	Not Reported	T	483	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Nitric acid, Lead (2+) salt	orthern Squawfis	Fish	Fresh	Mortality	NR	Not Reported	T	6300*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	EC10	Whole Organism	D	7		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	EC10	Whole Organism	D	39		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	EC10	Whole Organism	D	64		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	EC20	Whole Organism	D	55		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	EC20	Whole Organism	D	98		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	D	18		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	D	54		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	D	87		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	D	143		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	519.8	NR	NR	ug/g dry f	LAB	2006. Alves, L.C., C.N. Glover, and C.M. Wood. Dietary Pb Accumulation in Juvenile Freshwater Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.51(4): 615-625.
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	MATC	Whole Organism	D	12		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	MATC	Whole Organism	D	36		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	MATC	Whole Organism	D	57		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	MATC	Whole Organism	D	88		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	MATC	lultiple Tissue/Orga	D	NR	NA	NR	ug/L	LAB	1976. Davies, P.H., J.P.,Jr. Goettl, J.R. Sinley, and N.F. Smith. Acute and Chronic Toxicity of Lead to Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Water Res.10(3): 199-206.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	MATC	lultiple Tissue/Orga	D	NR	NA	NR	ug/L	LAB	1976. Davies, P.H., J.P.,Jr. Goettl, J.R. Sinley, and N.F. Smith. Acute and Chronic Toxicity of Lead to Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Water Res.10(3): 199-206.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	MATC	lultiple Tissue/Orga	D	NR	NA	NR	ug/L	LAB	1976. Davies, P.H., J.P.,Jr. Goettl, J.R. Sinley, and N.F. Smith. Acute and Chronic Toxicity of Lead to Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Water Res.10(3): 199-206.
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	D	8		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	D	24		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	D	37		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	D	54		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	76.5	NR	NR	ug/g dry f	LAB	2006. Alves, L.C., C.N. Glover, and C.M. Wood. Dietary Pb Accumulation in Juvenile Freshwater Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.51(4): 615-625.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	519.8	NR	NR	ug/g dry f	LAB	2006. Alves, L.C., C.N. Glover, and C.M. Wood. Dietary Pb Accumulation in Juvenile Freshwater Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.51(4): 615-625.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	519.8	NR	NR	ug/g dry f	LAB	2006. Alves, L.C., C.N. Glover, and C.M. Wood. Dietary Pb Accumulation in Juvenile Freshwater Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.51(4): 615-625.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	519.8	NR	NR	ug/g dry f	LAB	2006. Alves, L.C., C.N. Glover, and C.M. Wood. Dietary Pb Accumulation in Juvenile Freshwater Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.51(4): 615-625.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	480200	NR	NR	ug/L	LAB	2006. Alves, L.C., and C.M. Wood. The Chronic Effects of Dietary Lead in Freshwater Juvenile Rainbow Trout (Oncorhynchus mykiss) Fed Elevated Calcium Diets. Aquat. Toxicol.78(3): 217-232.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	480200	NR	NR	ug/L	LAB	2006. Alves, L.C., and C.M. Wood. The Chronic Effects of Dietary Lead in Freshwater Juvenile Rainbow Trout (Oncorhynchus mykiss) Fed Elevated Calcium Diets. Aquat. Toxicol.78(3): 217-232.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	480200	NR	NR	ug/L	LAB	2006. Alves, L.C., and C.M. Wood. The Chronic Effects of Dietary Lead in Freshwater Juvenile Rainbow Trout (Oncorhynchus mykiss) Fed Elevated Calcium Diets. Aquat. Toxicol.78(3): 217-232.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	6.2	NA	NR	ug/L	LAB	1973. Davies, P.H., and W.H. Everhart. Effects of Chemical Variations in Aquatic Environments: Vol. III Lead Toxicity to Rainbow Trout and Testing Application Factor Concept. EPA-R3-73-011C, U.S.EPA, Washington, D.C.: 80 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1993. Ruby, S.M., P. Jaroslawski, and R. Hull. Lead and Cyanide Toxicity in Sexually Maturing Rainbow Trout, Oncorhynchus mykiss During Spermatogenesis. Aquat. Toxicol.26(3-4): 225-238.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	11.9	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		D	12.2	NA	NR	ug/L	LAB	1973. Davies, P.H., and W.H. Everhart. Effects of Chemical Variations in Aquatic Environments: Vol. III Lead Toxicity to Rainbow Trout and Testing Application Factor Concept. EPA-R3-73-011C, U.S.EPA, Washington, D.C.: 80 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	12.5	NA	NR	ug/L	LAB	1973. Davies, P.H., and W.H. Everhart. Effects of Chemical Variations in Aquatic Environments: Vol. III Lead Toxicity to Rainbow Trout and Testing Application Factor Concept. EPA-R3-73-011C, U.S.EPA, Washington, D.C.: 80 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		D	19.5	NA	NR	ug/L	LAB	1973. Davies, P.H., and W.H. Everhart. Effects of Chemical Variations in Aquatic Environments: Vol. III Lead Toxicity to Rainbow Trout and Testing Application Factor Concept. EPA-R3-73-011C, U.S.EPA, Washington, D.C.: 80 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	23.8	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead	Rainbow Trout	Fish	Fresh	Growth	NR		T	32	NA	NR	ug/L	LAB	1980. Hodson, P.V., J.W. Hilton, B.R. Blunt, and S.J. Slinger. Effects of Dietary Ascorbic Acid on Chronic Lead Toxicity to Young Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.37(2): 170-176.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	58.5	D	27	ug/L	LAB	1973. Davies, P.H., and W.H. Everhart. Effects of Chemical Variations in Aquatic Environments: Vol. III Lead Toxicity to Rainbow Trout and Testing Application Factor Concept. EPA-R3-73-011C, U.S.EPA, Washington, D.C.: 80 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	120	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	200	D	18	ug/L	LAB	1973. Davies, P.H., and W.H. Everhart. Effects of Chemical Variations in Aquatic Environments: Vol. III Lead Toxicity to Rainbow Trout and Testing Application Factor Concept. EPA-R3-73-011C, U.S.EPA, Washington, D.C.: 80 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	370	D	32	ug/L	LAB	1973. Davies, P.H., and W.H. Everhart. Effects of Chemical Variations in Aquatic Environments: Vol. III Lead Toxicity to Rainbow Trout and Testing Application Factor Concept. EPA-R3-73-011C, U.S.EPA, Washington, D.C.: 80 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	543	NA	NR	ug/L	LAB	1982. Hodson, P.V., D.G. Dixon, D.J. Spry, D.M. Whittle, and J.B. Sprague. Effect of Growth Rate and Size of Fish on Rate of Intoxication by Waterborne Lead. Can. J. Fish. Aquat. Sci.39(9): 1243-1251.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	543	NA	NR	ug/L	LAB	1982. Hodson, P.V., D.G. Dixon, D.J. Spry, D.M. Whittle, and J.B. Sprague. Effect of Growth Rate and Size of Fish on Rate of Intoxication by Waterborne Lead. Can. J. Fish. Aquat. Sci.39(9): 1243-1251.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	7040000	NA	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-11, DNR, Boulder, CO: 58 p..
Lead	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Lead	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Lead	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1971. Goettl, J.P.. Water Pollution Studies. Fed.Aid Proj.No.F-33-R-6, Colorado Game, Fish and Parks Div., Div.Wildl., Ft.Collins, CO: 130 p..
Lead	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1998. Burden, V.M., M.B. Sandheinrich, and C.A. Caldwell. Effects of Lead on the Growth and delta-Aminolevulinic Acid Dehydratase Activity of Juvenile Rainbow Trout, Oncorhynchus mykiss. Environ. Pollut.101(2): 285-289.
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC10	Not Reported	D	26		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC10	Not Reported	D	108		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC20	Not Reported	D	34		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC20	Not Reported	D	113		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	55		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	120		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	120		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	133		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NR	NR	ug/L	LAB	1971. Goettl, J.P.. Water Pollution Studies. Fed.Aid Proj.No.F-33-R-6, Colorado Game, Fish and Parks Div., Div.Wildl., Ft.Collins, CO: 130 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Lead	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	200	NA	NR	ug/L	LAB	1976. Davies, P.H., J.P.,Jr. Goettl, J.R. Sinley, and N.F. Smith. Acute and Chronic Toxicity of Lead to Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Water Res.10(3): 199-206.
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Lead	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	290	NR	NR	ug/L	LAB	1971. Goettl, J.P.. Water Pollution Studies. Fed.Aid Proj.No.F-33-R-6, Colorado Game, Fish and Parks Div., Div.Wildl., Ft.Collins, CO: 130 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	470	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1000		NC	ug/L	LAB	2003. Sloman, K.A., D.W. Baker, C.G. Ho, D.G. McDonald, and C.M. Wood. The Effects of Trace Metal Exposure on Agonistic Encounters in Juvenile Rainbow Trout, Oncorhynchus mykiss. Aquat. Toxicol.63(2): 187-196.
Lead	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1170	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1170	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1170	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	1170	NA	NR	ug/L	LAB	1976. Davies, P.H., J.P.,Jr. Goettl, J.R. Sinley, and N.F. Smith. Acute and Chronic Toxicity of Lead to Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Water Res.10(3): 199-206.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	1320	NA	NR	ug/L	LAB	1976. Davies, P.H., J.P.,Jr. Goettl, J.R. Sinley, and N.F. Smith. Acute and Chronic Toxicity of Lead to Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Water Res.10(3): 199-206.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	1470	NA	NR	ug/L	LAB	1976. Davies, P.H., J.P.,Jr. Goettl, J.R. Sinley, and N.F. Smith. Acute and Chronic Toxicity of Lead to Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Water Res.10(3): 199-206.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. Chronic Toxicity of Water-Borne and Dietary Lead to Rainbow Trout (Salmo gairdneri) in Lake Ontario Water. Water Res.12(10): 869-878.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NR	NR	ug/L	LAB	1977. Hale, J.G.. Toxicity of Metal Mining Wastes. Bull. Environ. Contam. Toxicol.17(1): 66-73.
Lead	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1993. Bell, C.E., L.A. Baldwin, P.T. Kostecki, and E.J. Calabrese. Comparative Response of Rainbow Trout and Rat to the Liver Mitogen, Lead. Ecotoxicol. Environ. Saf.26(3): 280-284.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	30000	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	30800	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Lead	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	471000	D	1470	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	471000	D	1470	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	542000	D	1320	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	542000	D	1320	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	140	NA	NR	ug/L	LAB	1973. Davies, P.H., and W.H. Everhart. Effects of Chemical Variations in Aquatic Environments: Vol. III Lead Toxicity to Rainbow Trout and Testing Application Factor Concept. EPA-R3-73-011C, U.S.EPA, Washington, D.C.: 80 p..

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	1000	NA	NR	ug/L	LAB	1973. Davies, P.H., and W.H. Everhart. Effects of Chemical Variations in Aquatic Environments: Vol. III Lead Toxicity to Rainbow Trout and Testing Application Factor Concept. EPA-R3-73-011C, U.S.EPA, Washington, D.C.: 80 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	D	1380	NA	NR	ug/L	LAB	1973. Davies, P.H., and W.H. Everhart. Effects of Chemical Variations in Aquatic Environments: Vol. III Lead Toxicity to Rainbow Trout and Testing Application Factor Concept. EPA-R3-73-011C, U.S.EPA, Washington, D.C.: 80 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	140000	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	550000	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	1969. Kariya, T., H. Haga, Y. Haga, and K. Kimura. Studies on the Post-mortem Identification of the Pollutant in Fish Killed by Water Pollution - X. Acute Poisoning with Lead. Nippon Suisan Gakkaishi35(12): 1167-1171.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	1969. Kariya, T., H. Haga, Y. Haga, and K. Kimura. Studies on the Post-mortem Identification of the Pollutant in Fish Killed by Water Pollution - X. Acute Poisoning with Lead. Nippon Suisan Gakkaishi35(12): 1167-1171.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	200	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	D	7.6	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	D	14.6	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	D	54		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	67	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	D	125		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	360	D	31.6	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1190	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	470000	D	1260	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	540000	D	790	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	D	36		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	D	104		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	D	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	D	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	D	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	D	4	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	D	7.2	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	D	24		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	D	87		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	120	D	18.2	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	28	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	52	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	53	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	71	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	76	NA	NR	ug/L	LAB	1979. Hodson, P.V., B.R. Blunt, D. Jensen, and S. Morgan. Effect of Fish Age on Predicted and Observed Chronic Toxicity of Lead to Rainbow Trout in Lake Ontario Water. J. Great Lakes Res.5(1): 84-89.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	76	NA	NR	ug/L	LAB	1979. Hodson, P.V., B.R. Blunt, D. Jensen, and S. Morgan. Effect of Fish Age on Predicted and Observed Chronic Toxicity of Lead to Rainbow Trout in Lake Ontario Water. J. Great Lakes Res.5(1): 84-89.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	76	NA	NR	ug/L	LAB	1979. Hodson, P.V., B.R. Blunt, D. Jensen, and S. Morgan. Effect of Fish Age on Predicted and Observed Chronic Toxicity of Lead to Rainbow Trout in Lake Ontario Water. J. Great Lakes Res.5(1): 84-89.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	76	NA	NR	ug/L	LAB	1979. Hodson, P.V., B.R. Blunt, D. Jensen, and S. Morgan. Effect of Fish Age on Predicted and Observed Chronic Toxicity of Lead to Rainbow Trout in Lake Ontario Water. J. Great Lakes Res.5(1): 84-89.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	80	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	85	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	110	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	120	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	120	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	146	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	210	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	470	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	490	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	543	NA	NR	ug/L	LAB	1982. Hodson, P.V., D.G. Dixon, D.J. Spry, D.M. Whittle, and J.B. Sprague. Effect of Growth Rate and Size of Fish on Rate of Intoxication by Waterborne Lead. Can. J. Fish. Aquat. Sci.39(9): 1243-1251.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	740	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	900	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	910	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1978. Hodson, P.V., B.R. Blunt, and D.J. Spry. pH-Induced Changes in Blood Lead of Lead-Exposed Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.35(4): 437-445.
Lead chloride (PbCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1994. Sola, F., A. Masoni, and J. Isaia. Effects of Lead Loads on Branchial Osmoregulatory Mechanisms in the Rainbow Trout Oncorhynchus mykiss. J. Appl. Toxicol.14(5): 343-349.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1971. Goettl, J.P.. Water Pollution Studies. Fed.Aid Proj.No.F-33-R-6, Colorado Game, Fish and Parks Div., Div.Wildl., Ft.Collins, CO: 130 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-10, Jan 1-Dec 31, 1974, Colorado: 29 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1976. Davies, P.. Use of Dialysis Tubing in Defining the Toxic Fractions of Heavy Metals in Natural Waters. In: R.W.Andrew, P.V.Hodson, and D.E.Konasewich (Eds.) Toxicity to Biota of Metal Forms in Nat.Water, Int.Joint Comm., Windsor, Canada: 110-117.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1969. Kariya, T., H. Haga, Y. Haga, and K. Kimura. Studies on the Post-mortem Identification of the Pollutant in Fish Killed by Water Pollution - X. Acute Poisoning with Lead. Nippon Suisan Gakkaishi35(12): 1167-1171.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	400000	NA	NR	ug/L	LAB	1969. Kariya, T., H. Haga, Y. Haga, and K. Kimura. Studies on the Post-mortem Identification of the Pollutant in Fish Killed by Water Pollution - X. Acute Poisoning with Lead. Nippon Suisan Gakkaishi35(12): 1167-1171.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	480000	D	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	560000	D	5290	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	7.2	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	7.6	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	10.3	NR	NR	ug/L	LAB	2000. Ruby, S.M., R. Hull, and P. Anderson. Sublethal Lead Affects Pituitary Function of Rainbow Trout During Exogenous Vitellogenesis. Arch. Environ. Contam. Toxicol.38(1): 46-51.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	10.6	NR	NR	ug/L	LAB	2000. Ruby, S.M., R. Hull, and P. Anderson. Sublethal Lead Affects Pituitary Function of Rainbow Trout During Exogenous Vitellogenesis. Arch. Environ. Contam. Toxicol.38(1): 46-51.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	30	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Lead	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	41.2	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	220	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	519.8	NR	NR	ug/g dry f	LAB	2006. Alves, L.C., C.N. Glover, and C.M. Wood. Dietary Pb Accumulation in Juvenile Freshwater Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.51(4): 615-625.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	460000	D	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	480200	NR	NR	ug/L	LAB	2006. Alves, L.C., and C.M. Wood. The Chronic Effects of Dietary Lead in Freshwater Juvenile Rainbow Trout (Oncorhynchus mykiss) Fed Elevated Calcium Diets. Aquat. Toxicol.78(3): 217-232.
Nitric acid, Lead (2+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	520000	D	480	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Lead	Rainbow Trout	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1971. Goettl, J.P.. Water Pollution Studies. Fed.Aid Proj.No.F-33-R-6, Colorado Game, Fish and Parks Div., Div.Wildl., Ft.Collins, CO: 130 p..

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Razorback Sucker	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	170000	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Nitric acid, Lead (2+) salt	Razorback Sucker	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	170000	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Nitric acid, Lead (2+) salt	Sea Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	5000	NR	NR	ug/L	LAB	1925. Carpenter, K.E.. On the Biological Factors Involved in the Destruction of River-Fisheries by Pollution due to Lead-Mining. Ann. Appl. Biol.12(1): 1-13.
Nitric acid, Lead (2+) salt	Silver Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.
Lead	Smallmouth Bass	Fish	Fresh	Growth	NR		T	405	NA	NR	ug/L	LAB	1986. Coughlan, D.J., S.P. Gloss, and J. Kubota. Acute and Sub-Chronic Toxicity of Lead to the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Air Soil Pollut.28(3-4): 265-275.
Lead	Smallmouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1986. Coughlan, D.J., S.P. Gloss, and J. Kubota. Acute and Sub-Chronic Toxicity of Lead to the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Air Soil Pollut.28(3-4): 265-275.
Lead	Smallmouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1986. Coughlan, D.J., S.P. Gloss, and J. Kubota. Acute and Sub-Chronic Toxicity of Lead to the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Air Soil Pollut.28(3-4): 265-275.
Lead	Smallmouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	29000	NA	NR	ug/L	LAB	1986. Coughlan, D.J., S.P. Gloss, and J. Kubota. Acute and Sub-Chronic Toxicity of Lead to the Early Life Stages of Smallmouth Bass (Micropterus dolomieui). Water Air Soil Pollut.28(3-4): 265-275.
Lead	Snake-Head Catfish	Fish	Fresh	Growth	NR		T	5000	NA	NR	ug/L	NR	1987. Jana, S.R., and N. Bandyopadhyaya. Effect of Heavy Metals on Some Biochemical Parameters in the Freshwater Fish Channa punctatus. Aquat. Sci. Fish. Abstr.18(4): 5486-1Q18.
Lead	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	39510	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Lead	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	47310	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Lead	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	50660	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Lead	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	58400	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Lead	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	58540	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Nitric acid, Lead (2+) salt	Spiny Rayed Fish Class	Fish	NR	Mortality	NR	Not Reported	T	NR	NR	NR	M	NR	1930. Carpenter, K.E.. Further Researches on the Action of Metallic Salts on Fishes. J. Exp. Zool.56(4): 407-422.
Nitric acid, Lead (2+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.5*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Nitric acid, Lead (2+) salt	Tigerfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	21000	NR	NR	ug/L	LAB	2006. Oliveira Ribeiro, C.A., F. Filipak Neto, M. Mela, P.H. Silva, M.A.F. Randi, I.S. Rabitto, J.R.M. Alves Costa, and E. Pel. Hematological Findings in Neotropical Fish Hoplias malabaricus Exposed to Subchronic and Dietary Doses of Methylmercury, Inorganic Lead, and Tributyltin Chloride. Environ. Res.101(1): 74-80.
Nitric acid, Lead (2+) salt	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	202000	NA	NR	ug/L	LAB	1990. Tabche, L.M., C.M. Martinez, and E. Sanchez-Hidalgo. Comparative Study of Toxic Lead Effect on Gill and Haemoglobin of Tilapia Fish. J. Appl. Toxicol.10(3): 193-195.
Nitric acid, Lead (2+) salt	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	202000	NA	NR	ug/L	LAB	1991. Arias, G.S., L. Martinez-Tabche, and I. Galar. Effects of Paraquat and Lead on Fish Oreochromis hornorum. Bull. Environ. Contam. Toxicol.46(2): 237-241.
Nitric acid, Lead (2+) salt	Tilapia	Fish	Fresh	Mortality	LC50*	Not Reported	T	305000	NA	NR	ug/L	LAB	1990. Salmeron-Flores, P., E. Melendez-Camargo, and L. Martinez-Tabche. Hepatotoxic and Nephrotoxic Effects of Lead on the Tilapia (Sarotherodon aureus). An. Esc. Nac. Cienc. Biol. Mex.33: 147-156.
Nitric acid, Lead (2+) salt	Walleye	Fish	Fresh	Mortality	NR	Not Reported	T	397	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Nitric acid, Lead (2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	150000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Nitric acid, Lead (2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	150000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Nitric acid, Lead (2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	150000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.

Table C-14. Summary of Results from the EcoTox Database for Fish - Lead

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	110000*	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Nitric acid, Lead (2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Nitric acid, Lead (2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Nitric acid, Lead (2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Nitric acid, Lead (2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Nitric acid, Lead (2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Nitric acid, Lead (2+) salt	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Nitric acid, Lead (2+) salt	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	17000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Nitric acid, Lead (2+) salt	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	95000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Nitric acid, Lead (2+) salt	White Sucker	Fish	Fresh	Growth	NR		T	119	NA	NR	ug/L	LAB	1976. Sauter, S., K.S. Buxton, K.J. Macek, and S.R. Petrocelli. Effects of Exposure to Heavy Metals on Selected Freshwater Fish: Toxicity of Copper, Cadmium, Chromium and Lead to Eggs and Fry of Seven Fish Species. EPA-600/3-76-105, U.S.EPA, Duluth, MN: 74 p..
Nitric acid, Lead (2+) salt	White Sucker	Fish	Fresh	Growth	NR		T	253	NA	NR	ug/L	LAB	Mudgall and Patil 1988. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Lead	Winter Flounder	Fish	NR	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	Mudgall and Patil 1988. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Lead	Zambezi Barbel	Fish	Fresh	Mortality	NR	Not Reported	T	850	NR	NR	ug/L	LAB	Mudgall and Patil 1988. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Lead	Zambezi Barbel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	450	NR	NR	ug/L	LAB	Mudgall and Patil 1988. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Lead (2+) salt	Zambezi Barbel	Fish	Fresh	Reproduction	LOEC	Sperm	T	300000	NR	NR	ug/L	LAB	Mudgall and Patil 1988. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Lead (2+) salt	Zambezi Barbel	Fish	Fresh	Reproduction	LOEC	Sperm	T	300000	NR	NR	ug/L	LAB	Khargarot et al. 1985. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nitric acid, Lead (2+) salt	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	300000	NR	NR	ug/L	LAB	Mudgall and Patil 1988. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

Table C-15. Summary of Results from the EcoTox Database for Fish - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Manganese	Bony Fishes	Fish	Fresh	Mortality	NR	Not Reported	T	1	NA	NR	mg	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	700000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	600000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	600000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	300000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	150000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	NR	D	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	4410	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	8680	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	2780	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	4550	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	16210	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	7380	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	8680	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	8810	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	510	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	4410	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	D	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	15500	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	28290	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Brown Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	29880	NA	NR	ug/L	LAB	1997. Stubblefield, W.A., S.F. Brinkman, P.H. Davies, T.D. Garrison, J.R. Hockett, and M.W. McIntyre. Effects of Water Hardness on the Toxicity of Manganese to Developing Brown Trout (Salmo trutta). Environ. Toxicol. Chem.16(10): 2082-2089.
Manganese chloride (MnCl2)	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	2800*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Carbonic acid, Manganese(2+)salt	Common Carp	Fish	Fresh	Growth	NR		T	13100	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Carp of Manganese in White Fish Meal and of Various Manganese Compounds. Nippon Suisan Gakkaishi53(5): 825-832.

Table C-15. Summary of Results from the EcoTox Database for Fish - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Carbonic acid, Manganese(2+)salt	Common Carp	Fish	Fresh	Growth	NR		T	22600	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Carp of Manganese in White Fish Meal and of Various Manganese Compounds. Nippon Suisan Gakkaishi53(5): 825-832.
Manganese oxide (MnO2)	Common Carp	Fish	Fresh	Growth	NR		T	13700	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Carp of Manganese in White Fish Meal and of Various Manganese Compounds. Nippon Suisan Gakkaishi53(5): 825-832.
Manganese oxide (MnO2)	Common Carp	Fish	Fresh	Growth	NR		T	22700	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Carp of Manganese in White Fish Meal and of Various Manganese Compounds. Nippon Suisan Gakkaishi53(5): 825-832.
Manganese chloride (MnCl2)	Common Carp	Fish	Fresh	Growth	NR		T	13000	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Carp of Manganese in White Fish Meal and of Various Manganese Compounds. Nippon Suisan Gakkaishi53(5): 825-832.
Sulfuric acid, Manganese(2+) salt (1:1)	Common Carp	Fish	Fresh	Growth	NR		T	12800	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Carp of Manganese in White Fish Meal and of Various Manganese Compounds. Nippon Suisan Gakkaishi53(5): 825-832.
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	2480	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	2480	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	1770	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	1770	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	1270	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	1270	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	30600	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	36900	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	30600	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	38500	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	19690	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	14030	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	9990	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1270	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	4910000	NA	NR	ug/L	LAB	1987. Nath, K., and N. Kumar. Toxicity of Manganese and Its Impact on Some Aspects of Carbohydrate Metabolism of a Freshwater Teleost, Colisa fasciatus. Sci. Total Environ.67: 257-262.
Sulfuric acid, Manganese(2+) salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	4540000	NA	NR	ug/L	LAB	1987. Nath, K., and N. Kumar. Toxicity of Manganese and Its Impact on Some Aspects of Carbohydrate Metabolism of a Freshwater Teleost, Colisa fasciatus. Sci. Total Environ.67: 257-262.
Sulfuric acid, Manganese(2+) salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	3440000	NA	NR	ug/L	LAB	1987. Nath, K., and N. Kumar. Toxicity of Manganese and Its Impact on Some Aspects of Carbohydrate Metabolism of a Freshwater Teleost, Colisa fasciatus. Sci. Total Environ.67: 257-262.

Table C-15. Summary of Results from the EcoTox Database for Fish - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Manganese(2+) salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	1040000*	NA	NR	ug/L	LAB	1980. Agrawal, S.J., and A.K. Srivastava. Haematological Responses in a Fresh Water Fish to Experimental Manganese Poisoning. Toxicology17(1): 97-100.
Sulfuric acid, Manganese(2+) salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	3230000	NA	NR	ug/L	LAB	1987. Nath, K., and N. Kumar. Toxicity of Manganese and Its Impact on Some Aspects of Carbohydrate Metabolism of a Freshwater Teleost, Colisa fasciatus. Sci. Total Environ.67: 257-262.
Manganese chloride (MnCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8220	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Sulfuric acid, Manganese(2+) salt (1:1)	Longfin Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	130000	NA	NR	ug/L	LAB	1978. Lewis, M.. Acute Toxicity of Copper, Zinc, and Manganese in Single and Mixed Salt Solutions to Juvenile Longfin Dace, Agosia chrysogaster. J. Fish Biol.13(6): 695-700.
Manganese chloride (MnCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Hiraoka, Y., S. Ishizawa, T. Kamada, and H. Okuda. Acute Toxicity of 14 Different Kinds of Metals Affecting Medaka Fry. Hiroshima J. Med. Sci.34(3): 327-330.
Manganese	Minnow,Carp Family	Fish	Fresh	Mortality	NR	Not Reported	T	600000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1800000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	900000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	800000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	700000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	650000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese chloride	Mummichog	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5300*	NA	NR	ug/L	LAB	1915. Thomas, A.. Effects of Certain Metallic Salts upon Fishes. Trans. Am. Fish. Soc.44: 120-124.
Manganese chloride (MnCl2)	orthern Squawfis	Fish	Fresh	Mortality	NR	Not Reported	T	2800*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Manganese chloride (MnCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	0.017	NA	NR	ug/L	LAB	1997. Adam, C., J. Garnier-Laplace, and J.P. Baudin. Uptake from Water, Release and Tissue Distribution of 54Mn in the Rainbow Trout (Oncorhynchus mykiss Walbaum). Environ. Pollut.97(1-2): 29-38.
Manganese	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	T	388	NR	NR	ug/L	LAB	1981. Birge, W.J., J.A. Black, and B.A. Ramey. The Reproductive Toxicology of Aquatic Contaminants. In: J.Saxena and F.Fisher (Eds.), Hazard Assessment of Chemicals: Current Developments, Academic Press, New York, NY1: 59-115.
Manganese	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	958	NR	NR	ug/L	LAB	1981. Birge, W.J., J.A. Black, and B.A. Ramey. The Reproductive Toxicology of Aquatic Contaminants. In: J.Saxena and F.Fisher (Eds.), Hazard Assessment of Chemicals: Current Developments, Academic Press, New York, NY1: 59-115.
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	60000	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	2800	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	3000	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Manganese	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Manganese chloride (MnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2910	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Manganese chloride (MnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2910	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.

Table C-15. Summary of Results from the EcoTox Database for Fish - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	116000	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	14500	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	30000	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	87000	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5700	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9000	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC90	Not Reported	T	126000	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC90	Not Reported	T	11300	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC90	Not Reported	T	26500	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1978. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-13, DNR, Boulder, CO: 46.
Manganese	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	75000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	360*	NA	NR	ug/L	LAB	1976. Lewis, M.. Effects of Low Concentrations of Manganous Sulfate on Eggs and Fry of Rainbow Trout. Prog. Fish-Cult.38(2): 63-65.
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	3600*	NA	NR	ug/L	LAB	1976. Lewis, M.. Effects of Low Concentrations of Manganous Sulfate on Eggs and Fry of Rainbow Trout. Prog. Fish-Cult.38(2): 63-65.
Sulfuric acid, Manganese(2+) salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	3600*	NA	NR	ug/L	LAB	1976. Lewis, M.. Effects of Low Concentrations of Manganous Sulfate on Eggs and Fry of Rainbow Trout. Prog. Fish-Cult.38(2): 63-65.
Manganese nitrate	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	F	1000	NA	NR	ug/L	LAB	1976. Ingols, R.S.. The Cause of Trout Fish Kills Occurring in the Water From the Aerated Hypolimnion of Deep Lakes. Report ERC-0176, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, GA: 17 p..
Manganese nitrate	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	F	24000	NA	NR	ug/L	LAB	1976. Ingols, R.S.. The Cause of Trout Fish Kills Occurring in the Water From the Aerated Hypolimnion of Deep Lakes. Report ERC-0176, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, GA: 17 p..
Manganese	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	700000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	600000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	300000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	600000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	150000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Growth	LOEC	Not Reported	T	23000	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	2300	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC5	Not Reported	T	185600	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.

Table C-15. Summary of Results from the EcoTox Database for Fish - Manganese

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC5	Not Reported	T	120270	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC5	Not Reported	T	73120	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC5	Not Reported	T	58190	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	976170	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	470980	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	292880	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	231390	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC95	Not Reported	T	5133300	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC95	Not Reported	T	1844400	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC95	Not Reported	T	1117100	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Sulfuric acid, Manganese(2+) salt (1:1)	Speckled Tilapia	Fish	Fresh	Mortality	LC95	Not Reported	T	920220	NR	NR	ug/L	LAB	2006. Oyewo, E.O., and K.N. Don-Pedro. Acute Toxicity and Induced Weight Changes in Laboratory Tests with Mn and Cu Against Tilapia guineensis (Dumeril) and Tympanotonus fuscatus (Linne). J. Environ. Biol.27(2): 327-334.
Manganese	Tench	Fish	Fresh	Mortality	NR	Not Reported	T	1200000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Tench	Fish	Fresh	Mortality	NR	Not Reported	T	1300000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1800000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1500000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Manganese nitrate	Threespine Stickleback	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	300000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Manganese nitrate	Threespine Stickleback	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	40000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Sulfuric acid, Manganese(2+) salt (1:1)	Zander	Fish	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	erican Eared Pe	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1960. Boetius, J.. Lethal Action of Mercuric Chloride and Phenylmercuric Acetate on Fishes. Medd. Dan. Fisk. Havunders.3(4): 93-115.
Mercury chloride (HgCl2)	erican Eared Pe	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1960. Boetius, J.. Lethal Action of Mercuric Chloride and Phenylmercuric Acetate on Fishes. Medd. Dan. Fisk. Havunders.3(4): 93-115.
Mercury	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	190	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury chloride (HgCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	124	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Mercury chloride (HgCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	218	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Mercury chloride (HgCl2)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	2002. Sindhe, V.R., M.U. Veeresh, and R.S. Kulkarni. Ovarian Changes in Response to Heavy Metal Exposure to the Fish, Notopterus notopterus (Pallas). J. Environ. Biol.23(2): 137-141.
Mercury chloride (HgCl2)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	2002. Sindhe, V.R., M.U. Veeresh, and R.S. Kulkarni. Ovarian Changes in Response to Heavy Metal Exposure to the Fish, Notopterus notopterus (Pallas). J. Environ. Biol.23(2): 137-141.
Mercury chloride (HgCl2)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2002. Sindhe, V.R., M.U. Veeresh, and R.S. Kulkarni. Ovarian Changes in Response to Heavy Metal Exposure to the Fish, Notopterus notopterus (Pallas). J. Environ. Biol.23(2): 137-141.
Mercury	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury chloride (HgCl2)	Black Bullhead	Fish	Fresh	Growth	NR		T	5	NA	NR	umol/kg	LAB	1985. Heisinger, J.F., and L. Scott. Selenium Prevents Mercuric Chloride Induced Acute Osmoregulatory Failure Without Glutathione Peroxidase Involvement in the Black Bullhead (Ictalurus. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.80(2): 295-297.
Mercury chloride (HgCl2)	Bleak	Fish	Fresh	Mortality	LD50	Not Reported	T	700	NA	NR	ug/L	LAB	1972. Guerra, M., and N. Comodo. Possibilita' di Utilizzazione del Test di Ittiotossicita' per una Valutazione dei Limiti di Accettabilita' Negli Effluenti Industriali di Alcune Sost. Boll. Soc. Ital. Biol. Sper.48(22): 898-901.
Mercury chloride (HgCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	207*	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Mercury chloride (HgCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	1995. Abdelghani, A.A., Y.V. Pramar, T.K. Mandal, P.B. Tchounwou, and L. Heyer. Levels and Toxicities of Selected Inorganic and Organic Contaminants in a Swamp Environment. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes30(5): 717-731.
Mercury chloride (HgCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	185*	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Mercury chloride (HgCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1979. Heisinger, J.F., C.D. Hansen, and J.H. Kim. Effect of Selenium Dioxide on the Accumulation and Acute Toxicity of Mercuric Chloride in Goldfish. Arch. Environ. Contam. Toxicol.8(3): 279-283.
Mercury chloride (HgCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	118*	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Mercury chloride (HgCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	1995. Abdelghani, A.A., Y.V. Pramar, T.K. Mandal, P.B. Tchounwou, and L. Heyer. Levels and Toxicities of Selected Inorganic and Organic Contaminants in a Swamp Environment. J. Environ. Sci. Health Part B: Pestic. Food Contam. Agric. Wastes30(5): 717-731.
Mercury chloride (HgCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	118*	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Mercury chloride (HgCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	88.7	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Bluegill	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury	Bony Fishes	Fish	NR	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Kaviraj, A.. Effects of Mercury on the Behavior, Survival, Growth and Reproduction of Fish and on Aquatic Ecosystem. ASFA, 1978-1987 CDROM, Prepared by SilverPlatter Information Inc. , Updated to 9/95:AN 0959142 (ABS) / Environ. Ecol.1(1): 4-9.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	108	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Mercury chloride (HgCl2)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	61	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Mercury	Borneo Mullet	Fish	NR	Mortality	LC50	Not Reported	T	360	NA	NR	ug/L	LAB	1987. Nammalwar, P.. Pollution Impact and Management of the Coastal Estuaries Around Madras, India. In: N.B.Nair (Ed.), Proc.of the Natl.Semin.on Estuarine Manage., June 4-5, 1987, Trivandrum, India: 190-193.
Mercury	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	250	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	800	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	350	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	300	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury chloride (HgCl2)	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	12500	NA	NR	ug/L	NR	1927. Belding, D.L.. Toxicity Experiments with Fish in Reference to Trade Waste Pollution. I. The Problem of Water Pollution. Trans. Am. Fish. Soc.57: 100-119.
Mercuric nitrate	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1700	NR	NR	ug/L	LAB	1999. Sanchez-Galan, S., A.R. Linde, and E. Garcia-Vazquez. Brown Trout and European Minnow as Target Species for Genotoxicity Tests: Differential Sensitivity to Heavy Metals. Ecotoxicol. Environ. Saf.43(3): 301-304.
Mercury chloride (HgCl2)	Brown Trout	Fish	Fresh	Reproduction	LOEC	Sperm	T	500	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride (HgCl2)	Brown Trout	Fish	Fresh	Reproduction	NOEC	Sperm	T	500	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride (HgCl2)	Brown Trout	Fish	Fresh	Reproduction	NOEC	Sperm	T	500	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride (HgCl2)	Burbot	Fish	Fresh	Reproduction	LOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride (HgCl2)	Burbot	Fish	Fresh	Reproduction	LOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride (HgCl2)	Burbot	Fish	Fresh	Reproduction	NOEC	Sperm	T	5000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride (HgCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1986. Mohan, C.V., T.R.C. Gupta, and N.R. Menon. Acute Toxicity of Mercury on the Early Developmental Stages of Cirrhina mrigala (Ham.). Indian J. Fish.33(1): 133-136.
Mercury chloride (HgCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1986. Mohan, C.V., T.R.C. Gupta, and N.R. Menon. Acute Toxicity of Mercury on the Early Developmental Stages of Cirrhina mrigala (Ham.). Indian J. Fish.33(1): 133-136.
Mercury chloride (HgCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1986. Mohan, C.V., T.R.C. Gupta, and N.R. Menon. Acute Toxicity of Mercury on the Early Developmental Stages of Cirrhina mrigala (Ham.). Indian J. Fish.33(1): 133-136.
Mercury chloride (HgCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	28	NA	NR	ug/L	LAB	1986. Mohan, C.V., T.R.C. Gupta, and N.R. Menon. Acute Toxicity of Mercury on the Early Developmental Stages of Cirrhina mrigala (Ham.). Indian J. Fish.33(1): 133-136.
Mercury chloride (HgCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	74*	NA	NR	ug/L	LAB	1988. Shrivastava, S., K.S. Rao, S. Dhanekar, and S.S. Pandya. Determination of Acute Mercury Toxicity to Developing Stages of Cyprinus carpio and Cirrhinus mrigala. Fish. Technol.25(1): 29-31.
Mercury chloride (HgCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	74*	NA	NR	ug/L	LAB	1988. Shrivastava, S., K.S. Rao, S. Dhanekar, and S.S. Pandya. Determination of Acute Mercury Toxicity to Developing Stages of Cyprinus carpio and Cirrhinus mrigala. Fish. Technol.25(1): 29-31.
Mercury chloride (HgCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	742*	NA	NR	ug/L	LAB	1988. Shrivastava, S., K.S. Rao, S. Dhanekar, and S.S. Pandya. Determination of Acute Mercury Toxicity to Developing Stages of Cyprinus carpio and Cirrhinus mrigala. Fish. Technol.25(1): 29-31.
Mercury chloride (HgCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1986. Mohan, C.V., T.R.C. Gupta, and N.R. Menon. Acute Toxicity of Mercury on the Early Developmental Stages of Cirrhina mrigala (Ham.). Indian J. Fish.33(1): 133-136.
Mercury chloride (HgCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1984. Verma, S.R., I.P. Tonk, A.K. Gupta, and M. Saxena. Evaluation of an Application Factor for Determining the Safe Concentration of Agricultural and Industrial Chemicals. Water Res.18(1): 111-115.
Mercury chloride (HgCl2)	Carp, Hawk Fish	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. Verma, S.R., I.P. Tonk, A.K. Gupta, and M. Saxena. Evaluation of an Application Factor for Determining the Safe Concentration of Agricultural and Industrial Chemicals. Water Res.18(1): 111-115.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	960	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and F.I. Moussa. Short-Term Effects of Mercury on Survival, Behaviour, Bioaccumulation and Ionic Pattern in the Catfish (Clarias lazera). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.87(2): 303-308.
Mercury chloride (HgCl2)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	880	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and F.I. Moussa. Short-Term Effects of Mercury on Survival, Behaviour, Bioaccumulation and Ionic Pattern in the Catfish (Clarias lazera). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.87(2): 303-308.
Mercury chloride (HgCl2)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	810	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and F.I. Moussa. Short-Term Effects of Mercury on Survival, Behaviour, Bioaccumulation and Ionic Pattern in the Catfish (Clarias lazera). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.87(2): 303-308.
Mercury chloride (HgCl2)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	720	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and F.I. Moussa. Short-Term Effects of Mercury on Survival, Behaviour, Bioaccumulation and Ionic Pattern in the Catfish (Clarias lazera). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.87(2): 303-308.
Mercury chloride (HgCl2)	Catla	Fish	Fresh	Mortality	LC50	Not Reported	T	370*	NA	NR	ug/L	LAB	1987. Rai, R.. Responses of Serum Protein in a Freshwater Fish to Experimental Mercury Poisoning. J. Environ. Biol.8(Suppl. 2): 225-228.
Mercury chloride (HgCl2)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.3	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	30	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	25	NR	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. A Continuous Flow System Using Fish and Amphibian Eggs for Bioassay Determinations on Embryonic Mortality and Teratogenesis. EPA 560/5-77-002, U.S.EPA, Washington, D.C.: 71 p..
Mercury chloride (HgCl2)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Channel Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. A Continuous Flow System Using Fish and Amphibian Eggs for Bioassay Determinations on Embryonic Mortality and Teratogenesis. EPA 560/5-77-002, U.S.EPA, Washington, D.C.: 71 p..
Mercury chloride (HgCl2)	Channel Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1	NR	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. A Continuous Flow System Using Fish and Amphibian Eggs for Bioassay Determinations on Embryonic Mortality and Teratogenesis. EPA 560/5-77-002, U.S.EPA, Washington, D.C.: 71 p..
Mercury chloride (HgCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	168	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Mercury chloride (HgCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	19	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Mercury chloride (HgCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	101	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Mercury chloride (HgCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	17	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Ethyl(4-methyl-N-phenylbenzenesulfonamidato-kappaN)mercury	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Mercury chloride (HgCl2)	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	7000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Mercury chloride (HgCl2)	Chub	Fish	Fresh	Reproduction	LOEC	Sperm	T	50000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride (HgCl2)	Chub	Fish	Fresh	Reproduction	LOEC	Sperm	T	50000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride (HgCl2)	Chub	Fish	Fresh	Reproduction	NOEC	Sperm	T	50000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride (HgCl2)	Chum Salmon	Fish	NR	Mortality	NR	Not Reported	T	25	NA	NR	ug/L	LAB	1980. Petukhov, S.A., and N.G. Storozhuk. Toxic Effect of Mercury on Salmon Larval, Oncorhynchus keta and O. kisutch. J. Ichthyol.20(6): 138-141.
Mercury chloride (HgCl2)	Chum Salmon	Fish	NR	Mortality	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1980. Petukhov, S.A., and N.G. Storozhuk. Toxic Effect of Mercury on Salmon Larval, Oncorhynchus keta and O. kisutch. J. Ichthyol.20(6): 138-141.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Chum Salmon	Fish	NR	Mortality	NR	Not Reported	T	1	NA	NR	ug/L	LAB	1980. Petukhov, S.A., and N.G. Storozhuk. Toxic Effect of Mercury on Salmon Larval, Oncorhynchus keta and O. kisutch. J. Ichthyol.20(6): 138-141.
Mercury chloride	Cichlid	Fish	Fresh	Mortality	LC10	Not Reported	T	34		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Mercury chloride	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Mercury chloride	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Mercury chloride	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	155		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Mercuric nitrate	Climbing Perch	Fish	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1978. Panigrahi, A.K., and B.N. Misra. Toxicological Effects of Mercury on a Freshwater Fish, Anabas scandens, Cuv. and Val. and Their Ecological Implications. Environ. Pollut.16(1): 31-39.
Mercury chloride (HgCl2)	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	1020*	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	1030*	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	986*	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	994*	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	964*	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	964*	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	1500*	NA	NR	ug/L	LAB	1988. Banerjee, V., and K. Kumari. Effect of Zinc, Mercury and Cadmium on Erythrocyte and Related Parameters in the Fish Anabas testudineus. Environ. Ecol.6(3): 737-739.
Mercury chloride (HgCl2)	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	641	NA	NR	ug/L	LAB	1992. Sinha, T.K.P., and K. Kumar. Acute Toxicity of Mercuric Chloride to Anabas testudineus (Bloch). Environ. Ecol.10(3): 720-722.
Mercury chloride (HgCl2)	Climbing Perch	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1989. Jana, S., and S.S. Sahana. Sensitivity of the Freshwater Fishes Clarias batrachus and Anabas testudineus to Heavy Metals. Environ. Ecol.7(2): 265-270.
Mercuric nitrate	Climbing Perch	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1978. Panigrahi, A.K., and B.N. Misra. Toxicological Effects of Mercury on a Freshwater Fish, Anabas scandens, Cuv. and Val. and Their Ecological Implications. Environ. Pollut.16(1): 31-39.
Mercury	Coho Salmon,Silver Salmon	Fish	Fresh	Growth	NR	Not Reported	F	10	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Mercury chloride (HgCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1978. Lorz, H.W., R.H. Williams, and C.A. Fustish. Effects of Several Metals on Smolting of Coho Salmon. EPA-600/3-78-090, U.S.EPA, Corvallis, OR: 84 p..
Mercury chloride (HgCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	238	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Mercury chloride (HgCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	282	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Ethyl(4-methyl-N-phenylbenzenesulfonamidato-kappaN)mercury	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Mercury	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Mercury chloride (HgCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	7000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Mercury chloride (HgCl2)	Coho Salmon,Silver Salmon	Fish	NR	Mortality	NR	Not Reported	T	1	NA	NR	ug/L	LAB	1980. Petukhov, S.A., and N.G. Storozhuk. Toxic Effect of Mercury on Salmon Larval, Oncorhynchus keta and O. kisutch. J. Ichthyol.20(6): 138-141.
Mercury chloride (HgCl2)	Coho Salmon,Silver Salmon	Fish	NR	Mortality	NR	Not Reported	T	25	NA	NR	ug/L	LAB	1980. Petukhov, S.A., and N.G. Storozhuk. Toxic Effect of Mercury on Salmon Larval, Oncorhynchus keta and O. kisutch. J. Ichthyol.20(6): 138-141.
Mercury chloride (HgCl2)	Coho Salmon,Silver Salmon	Fish	NR	Mortality	NR	Not Reported	T	5	NA	NR	ug/L	LAB	1980. Petukhov, S.A., and N.G. Storozhuk. Toxic Effect of Mercury on Salmon Larval, Oncorhynchus keta and O. kisutch. J. Ichthyol.20(6): 138-141.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	10	NA	NR	ug/L	LAB	1990. Glubokov, A.I.. Growth of Three Species of Fish During Early Ontogeny Under Normal and Toxic Conditions. J. Ichthyol.30(2): 51-59.
Mercury chloride (HgCl2)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	168	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Mercury chloride (HgCl2)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	57	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Growth	NR	Not Reported	T	0.5	NA	NR	ug/L	LAB	1995. Yediler, A., and J. Jacobs. Synergistic Effects of Temperature; Oxygen and Water Flow on the Accumulation and Tissue Distribution of Mercury in Carp (Cyprinus carpio L.). Chemosphere31(11/12): 4437-4453.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1993. Radhakrishnaiah, K., A. Suresh, and B. Sivaramakrishna. Effect of Sublethal Concentration of Mercury and Zinc on the Energistics of a Freshwater Fish Cyprinus carpio (Linnaeus). Acta Biol. Hung.44(4): 375-385.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	710	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	770	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	570	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	620	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	710	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	770	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Mercury	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	940	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	LAB	1997. Gopal, V., S. Parvathy, and P.R. Balasubramanian. Effect of Heavy Metals on the Blood Protein Biochemistry of the Fish Cyprinus carpio and Its Use as a Bio-Indicator of Pollution Stress. Environ. Monit. Assess.48: 117-124.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4425	NR	NR	ug/L	LAB	1993. El-Bouhy, Z., A.M. Alkelch, G. Saleh, and A.M. Ali. Effects of Heavy Metals intoxication on Some Fresh Water Fish. Zag.J.Pharm.Sci.2(2): 73-90.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	305	NR	NR	ug/L	LAB	1994. Kaur, K., and A. Dhawan. Metal Toxicity to Different Life Stages of Cyprinus carpio Linn.. Indian J. Ecol.21(2): 93-98.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	72	NR	NR	ug/L	LAB	1994. Kaur, K., and A. Dhawan. Metal Toxicity to Different Life Stages of Cyprinus carpio Linn.. Indian J. Ecol.21(2): 93-98.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1110*	NA	NR	ug/L	LAB	1988. Shrivastava, S., K.S. Rao, S. Dhanekar, and S.S. Pandya. Determination of Acute Mercury Toxicity to Developing Stages of Cyprinus carpio and Cirrhinus mrigala. Fish. Technol.25(1): 29-31.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	370*	NA	NR	ug/L	LAB	1988. Shrivastava, S., K.S. Rao, S. Dhanekar, and S.S. Pandya. Determination of Acute Mercury Toxicity to Developing Stages of Cyprinus carpio and Cirrhinus mrigala. Fish. Technol.25(1): 29-31.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	40*	NA	NR	ug/L	LAB	1988. Shrivastava, S., K.S. Rao, S. Dhanekar, and S.S. Pandya. Determination of Acute Mercury Toxicity to Developing Stages of Cyprinus carpio and Cirrhinus mrigala. Fish. Technol.25(1): 29-31.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	159	NR	NR	ug/L	LAB	1994. Kaur, K., and A. Dhawan. Metal Toxicity to Different Life Stages of Cyprinus carpio Linn.. Indian J. Ecol.21(2): 93-98.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Kaur, K., and A. Dhawan. Metal Toxicity to Different Life Stages of Cyprinus carpio Linn.. Indian J. Ecol.21(2): 93-98.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1974. Huckabee, J.W., and N.A. Griffith. Toxicity of Mercury and Selenium to the Eggs of Carp (Cyprinus carpio). Trans. Am. Fish. Soc.4: 822-825.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	4425	NR	NR	ug/L	LAB	1993. El-Bouhy, Z., A.M. Alkelch, G. Saleh, and A.M. Ali. Effects of Heavy Metals intoxication on Some Fresh Water Fish. Zag.J.Pharm.Sci.2(2): 73-90.
Mercury chloride (HgCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. Kanajev, A.I., and A.V. Bykova. The Diagnostics of Fish Poisoning Using the Mercury Containing Compositions with the Chronicle Intoxication. Vestn.D S-Kh.Nauki (Mosc.)9: 81-88.
Mercury	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Mercury	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1500	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Mercury	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1500	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Mercury	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Mercury chloride (HgCl2)	Creek Chub	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Kim, J.H., E. Birks, and J.F. Heisinger. Protective Action of Selenium Against Mercury in Northern Cheek Chubs. Bull. Environ. Contam. Toxicol.17: 132-136.
Mercury chloride (HgCl2)	Eastern Mosquitofish	Fish	Fresh	Growth	NR	Not Reported	T	18	NA	NR	ug/L	FIELDU	1995. Mulvey, M., M.C. Newman, A. Chazal, M.M. Keklak, M.G. Heagler, and L.S.,Jr. Hales. Genetic and Demographic Response of Mosquitofish (Gambusia holbrooki Girard 1859) Populations Stressed by Mercury. Environ. Toxicol. Chem.14(8): 1411-1418.
Mercury chloride (HgCl2)	astern Mosquitofi	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	42	NA	NR	ug/L	FIELDU	1995. Mulvey, M., M.C. Newman, A. Chazal, M.M. Keklak, M.G. Heagler, and L.S.,Jr. Hales. Genetic and Demographic Response of Mosquitofish (Gambusia holbrooki Girard 1859) Populations Stressed by Mercury. Environ. Toxicol. Chem.14(8): 1411-1418.
Mercury chloride (HgCl2)	astern Mosquitofi	Fish	Fresh	Reproduction	NR	Not Reported	T	18	NA	NR	ug/L	FIELDU	1995. Mulvey, M., M.C. Newman, A. Chazal, M.M. Keklak, M.G. Heagler, and L.S.,Jr. Hales. Genetic and Demographic Response of Mosquitofish (Gambusia holbrooki Girard 1859) Populations Stressed by Mercury. Environ. Toxicol. Chem.14(8): 1411-1418.
Mercury chloride (HgCl2)	astern Mosquitofi	Fish	Fresh	Reproduction	NR	Not Reported	T	1040	NA	NR	ug/L	LAB	1992. Lee, C.J., M.C. Newman, and M. Mulvey. Time to Death of Mosquitofish (Gambusia holbrooki) During Acute Inorganic Mercury Exposure: Population Structure Effects. Arch. Environ. Contam. Toxicol.22: 284-287.
Methyl mercury(1+), Ion	uropean Graylin	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Vollestad, L.A., E. Fjeld, T. Haugen, and S.A. Oxnevad. Developmental Instability in Grayling (Thymallus thymallus) Exposed to Methylmercury During Embryogenesis. Environ. Pollut.101: 349-354.
Methyl mercury(1+), Ion	uropean Graylin	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Vollestad, L.A., E. Fjeld, T. Haugen, and S.A. Oxnevad. Developmental Instability in Grayling (Thymallus thymallus) Exposed to Methylmercury During Embryogenesis. Environ. Pollut.101: 349-354.
Methyl mercury(1+), Ion	uropean Graylin	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Vollestad, L.A., E. Fjeld, T. Haugen, and S.A. Oxnevad. Developmental Instability in Grayling (Thymallus thymallus) Exposed to Methylmercury During Embryogenesis. Environ. Pollut.101: 349-354.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	0.23	NR	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	0.483	NR	NR	ug/L	LAB	1992. Call, D.J., and D.L. Geiger. Subchronic Toxicities of Industrial and Agricultural Chemicals to Fathead Minnows (Pimephales promelas). Volume I. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 318 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	0.872	NR	NR	ug/L	LAB	1992. Call, D.J., and D.L. Geiger. Subchronic Toxicities of Industrial and Agricultural Chemicals to Fathead Minnows (Pimephales promelas). Volume I. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 318 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	0.23	NR	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	0.335	NR	NR	ug/L	LAB	1992. Call, D.J., and D.L. Geiger. Subchronic Toxicities of Industrial and Agricultural Chemicals to Fathead Minnows (Pimephales promelas). Volume I. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 318 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	0.649	NR	NR	ug/L	LAB	1992. Call, D.J., and D.L. Geiger. Subchronic Toxicities of Industrial and Agricultural Chemicals to Fathead Minnows (Pimephales promelas). Volume I. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 318 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	0.232	NR	NR	ug/L	LAB	1992. Call, D.J., and D.L. Geiger. Subchronic Toxicities of Industrial and Agricultural Chemicals to Fathead Minnows (Pimephales promelas). Volume I. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 318 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	0.483	NR	NR	ug/L	LAB	1992. Call, D.J., and D.L. Geiger. Subchronic Toxicities of Industrial and Agricultural Chemicals to Fathead Minnows (Pimephales promelas). Volume I. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 318 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	0.26	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	2.01	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	3.69	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	0.26	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	0.5	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	0.58	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	1.27	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	0.26	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	0.31	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	0.58	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	1.02	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	2.01	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	196	NA	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	67	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	155	NA	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	168	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	112	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	84	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	74	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Call, D.J., L.T. Brooke, and N. Ahmad. Toxicity, Bioconcentration and Metabolism of Selected Chemicals in Aquatic Organisms. Third Quarterly Prog.Rep.to EPA, EPA Coop.Agreement No.CR 806864020, Univ.of Wisconsin, Superior, WI: 38 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Call, D.J., L.T. Brooke, and N. Ahmad. Toxicity, Bioconcentration and Metabolism of Selected Chemicals in Aquatic Organisms. Third Quarterly Prog.Rep.to EPA, EPA Coop.Agreement No.CR 806864020, Univ.of Wisconsin, Superior, WI: 38 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Call, D.J., L.T. Brooke, and N. Ahmad. Toxicity, Bioconcentration and Metabolism of Selected Chemicals in Aquatic Organisms. Third Quarterly Prog.Rep.to EPA, EPA Coop.Agreement No.CR 806864020, Univ.of Wisconsin, Superior, WI: 38 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Call, D.J., L.T. Brooke, and N. Ahmad. Toxicity, Bioconcentration and Metabolism of Selected Chemicals in Aquatic Organisms. Third Quarterly Prog.Rep.to EPA, EPA Coop.Agreement No.CR 806864020, Univ.of Wisconsin, Superior, WI: 38 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Call, D.J., L.T. Brooke, and N. Ahmad. Toxicity, Bioconcentration and Metabolism of Selected Chemicals in Aquatic Organisms. Third Quarterly Prog.Rep.to EPA, EPA Coop.Agreement No.CR 806864020, Univ.of Wisconsin, Superior, WI: 38 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Call, D.J., L.T. Brooke, and N. Ahmad. Toxicity, Bioconcentration and Metabolism of Selected Chemicals in Aquatic Organisms. Third Quarterly Prog.Rep.to EPA, EPA Coop.Agreement No.CR 806864020, Univ.of Wisconsin, Superior, WI: 38 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Call, D.J., L.T. Brooke, and N. Ahmad. Toxicity, Bioconcentration and Metabolism of Selected Chemicals in Aquatic Organisms. Third Quarterly Prog.Rep.to EPA, EPA Coop.Agreement No.CR 806864020, Univ.of Wisconsin, Superior, WI: 38 p..
Mercuric nitrate	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	172	NA	NR	ug/L	LAB	1986. Spehar, R.L., and J.T. Fiandt. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem.5(10): 917-931.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	1.85	NR	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	1.25	NR	NR	ug/L	LAB	1992. Call, D.J., and D.L. Geiger. Subchronic Toxicities of Industrial and Agricultural Chemicals to Fathead Minnows (Pimephales promelas). Volume I. Ctr.for Lake Superior Environ.Stud., Univ.of Wisconsin-Superior, Superior, WI: 318 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	3.7	NR	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	3.7	NR	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.87	NR	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	3.04	NA	NR	ug/L	LAB	1995. Handy, R.D.. Comparison of Intermittent and Continuous Exposure to Mercuric Chloride in Rainbow Trout (Oncorhynchus mykiss), Goldfish (Carassius auratus), and the. Can. J. Fish. Aquat. Sci.52(1): 13-22.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Handy, R.D.. Comparison of Intermittent and Continuous Exposure to Mercuric Chloride in Rainbow Trout (Oncorhynchus mykiss), Goldfish (Carassius auratus), and the. Can. J. Fish. Aquat. Sci.52(1): 13-22.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	2.43	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	3.69	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	4.51	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	3.69	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	2.43	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	3.69	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	4.51	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.87	NR	NR	ug/L	LAB	1983. Call, D.J., L.T. Brooke, N. Ahmad, and J.E. Richter. Toxicity and Metabolism Studies with EPA (Environmental Protection Agency) Priority Pollutants and Related Chemicals in Freshwater Organisms. EPA 600/3-83-095, U.S.EPA, Duluth, MN: 120 p..

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Reproduction	NR	Not Reported	T	0.5	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Mercury chloride (HgCl2)	Fathead Minnow	Fish	Fresh	Reproduction	NR	Not Reported	T	1.02	NA	NR	ug/L	LAB	1982. Snarski, V.M., and G.F. Olson. Chronic Toxicity and Bioaccumulation of Mercuric Chloride in the Fathead Minnow (Pimephales promelas). Aquat. Toxicol.2: 143-156.
Methyl mercury(1+), Ion	Finescale Dace	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1997. Hall, B.D., R.A. Bodaly, R.J.P. Fudge, J.W.M. Rudd, and D.M. Rosenberg. Food as the Dominant Pathway of Methylmercury Uptake by Fish. Water Air Soil Pollut.100(1-2): 13-24.
Mercury chloride (HgCl2)	Giant Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1982. Saxena, A.B., D.S. Rao, and Z.U. Khan. Studies on the Acute Toxicities of Copper, Mercury, and Cadmium to Danio malabaricus and Puntius ticto. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control17(5): 657-665.
Mercury	Goldfish	Fish	Fresh	Growth	NR	Not Reported	T	0.25	NA	NR	ug/L	LAB	1984. Westerman, A.G.. The Chronic Effects of Low-Level Mercury and Cadmium to Goldfish (Carassius auratus). Diss. Abstr. Int. B Sci. Eng. 45:1096 / Ph. D. Thesis, University of Kentucky, Lexington, KY: 263 p..
Mercury	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	400	NA	NR	ug/L	LAB	1980. Sharma, D.C., and P.S. Davis. Effect of Sodium Selenite and Selenomethionine on the Accumulation and Acute Toxicity of Mercuric and Methylmercuric Chloride in the Goldfish. Indian J. Exp. Biol.18(1): 82-84.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	820	NA	NR	ug/L	LAB	1970. Weir, P.A., and C.H. Hine. Effects of Various Metals on Behavior of Conditioned Goldfish. Arch. Environ. Health20(1): 45-51.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. A Continuous Flow System Using Fish and Amphibian Eggs for Bioassay Determinations on Embryonic Mortality and Teratogenesis. EPA 560/5-77-002, U.S.EPA, Washington, D.C.: 71 p..
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.7	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	121.9	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.7	NA	NR	ug/L	LAB	1984. Westerman, A.G.. The Chronic Effects of Low-Level Mercury and Cadmium to Goldfish (Carassius auratus). Diss. Abstr. Int. B Sci. Eng. 45:1096 / Ph. D. Thesis, University of Kentucky, Lexington, KY: 263 p..
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	1970. Haga, Y., H. Haga, T. Hagino, and T. Kariya. Studies on the Post-Mortem Identification of the Pollutant in Fish Killed by Water Pollution - XII. Acute Poisoning with Mercury (1). Nippon Suisan Gakkaishi36(3): 225-231.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	LD50	Not Reported	T	1100	NA	NR	ug/L	LAB	1972. Guerra, M., and N. Comodo. Possibilita' di Utilizzazione del Test di Ittiotossicita' per una Valutazione dei Limiti di Accettabilita' Negli Effluenti Industriali di Alcune Sost. Boll. Soc. Ital. Biol. Sper.48(22): 898-901.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100	NA	NR	ug/L	LAB	1973. Baker III, D.H.. Mercury: Uptake by the Goldfish, Carassius auratus, From Low Concentrations in Water and its Tissue Distribution. M.S.Thesis, New Mexico Institute of Mining and Technology, Socorro, NM: 37 p..
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	20	NA	NR	ug/L	LAB	1973. Baker III, D.H.. Mercury: Uptake by the Goldfish, Carassius auratus, From Low Concentrations in Water and its Tissue Distribution. M.S.Thesis, New Mexico Institute of Mining and Technology, Socorro, NM: 37 p..
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. A Continuous Flow System Using Fish and Amphibian Eggs for Bioassay Determinations on Embryonic Mortality and Teratogenesis. EPA 560/5-77-002, U.S.EPA, Washington, D.C.: 71 p..
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4.8	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	740*	NA	NR	ug/L	LAB	1947. Ellis, M.M.. Toxicity of Phenyl Mercuric Lactate for Fish. Spec.Sci.Rep., No.42, U.S.Fish Wildl.Serv.: 6 p..

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercuric nitrate	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1996. Coello, W.F., and M.A.Q. Khan. Protection Against Heavy Metal Toxicity by Mucus and Scales in Fish. Arch. Environ. Contam. Toxicol.30: 319-326.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1970. Haga, Y., H. Haga, T. Hagino, and T. Kariya. Studies on the Post-Mortem Identification of the Pollutant in Fish Killed by Water Pollution - XII. Acute Poisoning with Mercury (1). Nippon Suisan Gakkaishi36(3): 225-231.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1970. Haga, Y., H. Haga, T. Hagino, and T. Kariya. Studies on the Post-Mortem Identification of the Pollutant in Fish Killed by Water Pollution - XII. Acute Poisoning with Mercury (1). Nippon Suisan Gakkaishi36(3): 225-231.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Handy, R.D.. Comparison of Intermittent and Continuous Exposure to Mercuric Chloride in Rainbow Trout (Oncorhynchus mykiss), Goldfish (Carassius auratus), and the. Can. J. Fish. Aquat. Sci.52(1): 13-22.
Mercury chloride (HgCl2)	Goldfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2	NR	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. A Continuous Flow System Using Fish and Amphibian Eggs for Bioassay Determinations on Embryonic Mortality and Teratogenesis. EPA 560/5-77-002, U.S.EPA, Washington, D.C.: 71 p..
Mercury	Goldfish	Fish	Fresh	Reproduction	NR	Not Reported	T	0.25	NA	NR	ug/L	LAB	1984. Westerman, A.G.. The Chronic Effects of Low-Level Mercury and Cadmium to Goldfish (Carassius auratus). Diss. Abstr. Int. B Sci. Eng. 45:1096 / Ph. D. Thesis, University of Kentucky, Lexington, KY: 263 p..
Mercury	Grass Carp, White Amur	Fish	Fresh	Growth	NR	Not Reported	T	1.3	NA	NR	ug/L	LAB	1990. Mao, S., and C. Wang. The Effect of Some Pollutants on SCE of Grass Carp (Ctenopharyngodon idellus) Cells. Oceanol. Limnol. Sin. /Haiyang Yu Huzhao21(3): 205-211.
Mercury	Grass Carp, White Amur	Fish	Fresh	Growth	NR	Kidney	T	1.3	NA	NR	ug/L	LAB	1990. Mao, S., and C. Wang. The Effect of Some Pollutants on SCE of Grass Carp (Ctenopharyngodon idellus) Cells. Oceanol. Limnol. Sin. /Haiyang Yu Huzhao21(3): 205-211.
Mercuric nitrate	Green Sunfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1996. Coello, W.F., and M.A.Q. Khan. Protection Against Heavy Metal Toxicity by Mucus and Scales in Fish. Arch. Environ. Contam. Toxicol.30: 319-326.
Mercury chloride (HgCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Hamdy, M.K.. Biochemical Transformation and Detoxification of Mercury in Aquatic Environment. Tech.Rep.Project No.B-069-GA, Environ.Resource Center, Georgia Inst.of Technology, Atlanta, GA: 86 p..
Mercury chloride (HgCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	14000*	NA	NR	ug/L	LAB	1980. Deshmukh, S.S., and V.B. Marathe. Size Related Toxicity of Copper and Mercury to Lebistes reticulatus (Peter), Labeo rohita (Ham.) and Cyprinus carpio Linn. Indian J. Exp. Biol.18: 421-423.
Mercury chloride (HgCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	7800*	NA	NR	ug/L	LAB	1980. Deshmukh, S.S., and V.B. Marathe. Size Related Toxicity of Copper and Mercury to Lebistes reticulatus (Peter), Labeo rohita (Ham.) and Cyprinus carpio Linn. Indian J. Exp. Biol.18: 421-423.
Mercury chloride (HgCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	410	NR	NR	ug/L	LAB	1979. Kuhn, R., and J.H. Canton. Comparative Hydrobiological-Toxicological Results in Micro- and Macroorganisms of Biological Spectra (Vergleichende Hydrobiologisch-Toxikologische Befunde an Mikro- und Makroorganismen Biologischer Spektren). In: K.Aurand and J.Spaander (Eds.), Reinhaltung des Wassers, Verlag, Berlin, GER: 58-68.
Mercury chloride (HgCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	41	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Study of the Toxicity of Mercury, Copper, Zinc and Trinitroresorcinol on Lebistes reticulateus, Method of Survival (Ispitivanje Toksicnosti Zive, Bakra, Cinka i Trinitrorezorcina na Lebistes reticulatus. Bioogled Kratko. Arh. Hig. Rada Toksikol.28(1): 3-16.
Mercury	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Jones, W.E.. Detection of Pollutants by Fish Tests. Water Treat. Exam.24: 132-139.
Mercury chloride (HgCl2)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1960. Boetius, J.. Lethal Action of Mercuric Chloride and Phenylmercuric Acetate on Fishes. Medd. Dan. Fisk. Havunders.3(4): 93-115.
Mercury chloride (HgCl2)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1960. Boetius, J.. Lethal Action of Mercuric Chloride and Phenylmercuric Acetate on Fishes. Medd. Dan. Fisk. Havunders.3(4): 93-115.
Mercury chloride (HgCl2)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1960. Boetius, J.. Lethal Action of Mercuric Chloride and Phenylmercuric Acetate on Fishes. Medd. Dan. Fisk. Havunders.3(4): 93-115.
Mercury chloride (HgCl2)	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1600	NA	NR	ug/L	LAB	1971. Matida, Y., H. Kumada, S. Kimura, Y. Saiga, T. Nose, M. Yokote, and H. Kawatsu. Toxicity of Mercury Compounds to Aquatic Organisms and Accumulation of the Compounds by the Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)21(2): 197-227.
Mercury chloride (HgCl2)	Indian Catfish	Fish	Fresh	Growth	NR	Not Reported	T	60	NA	NR	ug/L	LAB	1995. James, R., K. Sampath, V. Sivakumar, S. Babu, and P. Shanmuganandam. Toxic Effects of Copper and Mercury on Food Intake, Growth and Proximate Chemical Composition in Heteropneustes fossilis. J. Environ. Biol.16(1): 1-6.
Mercury chloride (HgCl2)	Indian Catfish	Fish	Fresh	Growth	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1992. Singh, A., and J.S.D. Munshi. Effects of Sublethal Mercuric Chloride Exposure on Melanophores of a Catfish, Heteropneustes fossilis (Bloch.). J. Environ. Biol.13(4): 303-308.
Mercury	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	99	NA	NR	ug/L	LAB	1993. James, R., K. Sampath, and G. Devakiamma. Accumulation and Depuration of Mercury in a Catfish Heteropneustes fossilis (Pisces: Heteropneustidae) Exposed to Sublethal Doses of the Element. Asian Fish. Sci.6(2): 183-191.
Mercury	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	99	NA	NR	ug/L	LAB	1992. James, R., K. Sampath, V. Jancy Pattu, and G. Devakiamma. Utilization of Eichhornia crassipes for the Reduction of Mercury Toxicity on Food Transformation in Heteropneustes fossilis. J. Aquacult. Trop.7: 189-196.
Mercury chloride (HgCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1995. James, R., K. Sampath, V. Sivakumar, S. Babu, and P. Shanmuganandam. Toxic Effects of Copper and Mercury on Food Intake, Growth and Proximate Chemical Composition in Heteropneustes fossilis. J. Environ. Biol.16(1): 1-6.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	99	NA	NR	ug/L	LAB	1991. James, R., V.J. Pattu, G. Devakiamma, and K. Sampath. Impact of Sublethal Levels of Mercury on Glycogen and Selected Respiratory Enzymes in Heteropneustes fossilis and Role of Water Hyacinth in Reduction. Indian J. Fish.38(4): 249-252.
Mercury chloride (HgCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	270.6	NA	NR	ug/L	LAB	1993. Rajan, M.T., and T.K. Banerjee. Histopathological Changes in the Respiratory Epithelium of the Air-Breathing Organ (Branchial Diverteculum) of the Live Fish Heteropneustes fossilis. J. Freshw. Biol.5(3): 269-275.
Mercury chloride (HgCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1000*	NA	NR	ug/L	LAB	1981. Gupta, P.K., and K.V. Sastry. Alterations in the Activities of Three Dehydrogenases in the Digestive System of Two Teleost Fishes Exposed to Mercuric Chloride. Environ. Res.24: 15-23.
Sulfuric acid, Mercury(2+) salt(1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	NA	NR	ug/L	LAB	1998. Banerjee, V.. Influence of Zinc and Mercury on Blood Parameters of the Fish Heteropneustes fossilis. Environ. Ecol.16(1): 79-84.
Sulfuric acid, Mercury(2+) salt(1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1986. Banerjee, V.. Effect of Heavy Metal Poisoning on Peripheral Haemogram in Heteropneustes fossilis (Bloch): I. Mercuric Sulfate (LC50). Comp. Physiol. Ecol.11(4): 173-176.
Mercury chloride (HgCl2)	Indian Catfish	Fish	NR	Mortality	LC50	Not Reported	T	260*	NA	NR	ug/L	LAB	1980. Das, K.K., S.G. Dastidar, S. Chakrabarty, and S.K. Banerjee. Toxicity of Mercury: A Comparative Study in Air-Breathing and Non Air-Breathing Fish. Hydrobiologia68(3): 225-229.
Mercury	Indian Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	140	NA	NR	ug/L	LAB	1992. James, R., K. Sampath, V. Jancy Pattu, and G. Devakiamma. Utilization of Eichhornia crassipes for the Reduction of Mercury Toxicity on Food Transformation in Heteropneustes fossilis. J. Aquacult. Trop.7: 189-196.
Mercury	Indian Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	55	NA	NR	ug/L	LAB	1992. James, R., K. Sampath, V. Jancy Pattu, and G. Devakiamma. Utilization of Eichhornia crassipes for the Reduction of Mercury Toxicity on Food Transformation in Heteropneustes fossilis. J. Aquacult. Trop.7: 189-196.
Mercury chloride (HgCl2)	Indian Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Prasad, M.S.. Effect of Short-Term Exposure to Mercuric Chloride on the Air-Breathing Catfish, Heteropneustes fossilis. I. Light Microscopic Study of the Gill. Biomed. Environ. Sci.7(4): 327-336.
Mercury chloride (HgCl2)	Indian Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000*	NA	NR	ug/L	LAB	1989. Shrivastava, S., and K.S. Rao. Studies on Activity Recovery in Some Mercury-Exposed Freshwater Fish by Using Selected Weeds. Bull. Environ. Contam. Toxicol.42(6): 840-846.
Mercury chloride (HgCl2)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Mercury chloride (HgCl2)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. A Continuous Flow System Using Fish and Amphibian Eggs for Bioassay Determinations on Embryonic Mortality and Teratogenesis. EPA 560/5-77-002, U.S.EPA, Washington, D.C.: 71 p..
Mercury chloride (HgCl2)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	5.3	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Largemouth Bass	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Largemouth Bass	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. A Continuous Flow System Using Fish and Amphibian Eggs for Bioassay Determinations on Embryonic Mortality and Teratogenesis. EPA 560/5-77-002, U.S.EPA, Washington, D.C.: 71 p..
Mercury chloride (HgCl2)	Largemouth Bass	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercuric nitrate	Largemouth Bass	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1996. Coello, W.F., and M.A.Q. Khan. Protection Against Heavy Metal Toxicity by Mucus and Scales in Fish. Arch. Environ. Contam. Toxicol.30: 319-326.
Mercury chloride (HgCl2)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	980*	NA	NR	ug/L	LAB	1986. Victor, B., S. Mahalingam, and R. Sarojini. Toxicity of Mercury and Cadmium on Oocyte Differentiation and Vitellogenesis of the Teleost, Lepidocephalichtyhs thermalis (Bleeker). J. Environ. Biol.7(4): 209-214.
Mercury chloride (HgCl2)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	750*	NA	NR	ug/L	LAB	1986. Victor, B., S. Mahalingam, and R. Sarojini. Toxicity of Mercury and Cadmium on Oocyte Differentiation and Vitellogenesis of the Teleost, Lepidocephalichtyhs thermalis (Bleeker). J. Environ. Biol.7(4): 209-214.
Mercury chloride (HgCl2)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	730*	NA	NR	ug/L	LAB	1986. Victor, B., S. Mahalingam, and R. Sarojini. Toxicity of Mercury and Cadmium on Oocyte Differentiation and Vitellogenesis of the Teleost, Lepidocephalichtyhs thermalis (Bleeker). J. Environ. Biol.7(4): 209-214.
Mercury chloride (HgCl2)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	630*	NA	NR	ug/L	LAB	1986. Victor, B., S. Mahalingam, and R. Sarojini. Toxicity of Mercury and Cadmium on Oocyte Differentiation and Vitellogenesis of the Teleost, Lepidocephalichtyhs thermalis (Bleeker). J. Environ. Biol.7(4): 209-214.
Mercury chloride (HgCl2)	Medaka, High-Eye	Fish	Fresh	Growth	NR		T	15	NA	NR	ug/L	LAB	1975. Heisinger, J.F., and W. Green. Mercuric Chloride Uptake by Eggs of the Ricefish and Resulting Teratogenic Effects. Bull. Environ. Contam. Toxicol.14(6): 665-673.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1970. Akiyama, A.. Acute Toxicity of Two Organic Mercury Compounds to the Teleost, Oryzias latipes, in Different Stages of Development. Nippon Suisan Gakkaishi36(6): 563-570.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	T	1200	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	T	520*	NA	NR	ug/L	LAB	1984. Nagashima, Y., T. Kikuchi, and M. Chiba. Toxicity and Accumulation of Mercury in Fish, the Himedaka Oryzias latipes. Nippon Suisan Gakkaishi50(1): 95-99.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	T	5900	NA	NR	ug/L	LAB	1980. Bowers, M.A., D.E. Dostal, and J.F. Heisinger. Failure of Selenite to Protect Against Mercuric Chloride in Early Developmental Stages of the Japanese Ricefish (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.66(2): 175-178.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	T	6500	NA	NR	ug/L	LAB	1980. Bowers, M.A., D.E. Dostal, and J.F. Heisinger. Failure of Selenite to Protect Against Mercuric Chloride in Early Developmental Stages of the Japanese Ricefish (Oryzias latipes). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.66(2): 175-178.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	1975. Heisinger, J.F., and W. Green. Mercuric Chloride Uptake by Eggs of the Ricefish and Resulting Teratogenic Effects. Bull. Environ. Contam. Toxicol.14(6): 665-673.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1975. Heisinger, J.F., and W. Green. Mercuric Chloride Uptake by Eggs of the Ricefish and Resulting Teratogenic Effects. Bull. Environ. Contam. Toxicol.14(6): 665-673.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	NR	Not Reported	T	15	NA	NR	ug/L	LAB	1975. Heisinger, J.F., and W. Green. Mercuric Chloride Uptake by Eggs of the Ricefish and Resulting Teratogenic Effects. Bull. Environ. Contam. Toxicol.14(6): 665-673.
Mercury chloride (HgCl2)	edaka, High-Eye	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Hiraoka, Y., S. Ishizawa, T. Kamada, and H. Okuda. Acute Toxicity of 14 Different Kinds of Metals Affecting Medaka Fry. Hiroshima J. Med. Sci.34(3): 327-330.
Mercury chloride (HgCl2)	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	N	LAB	1927. Carpenter, K.E.. The Lethal Action of Soluble Metallic Salts on Fishes. Br. J. Exp. Biol.4: 378-391.
Mercuric nitrate	Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1700	NR	NR	ug/L	LAB	1999. Sanchez-Galan, S., A.R. Linde, and E. Garcia-Vazquez. Brown Trout and European Minnow as Target Species for Genotoxicity Tests: Differential Sensitivity to Heavy Metals. Ecotoxicol. Environ. Saf.43(3): 301-304.
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR	Not Reported	T	290	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR	Not Reported	T	700	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury chloride (HgCl2)	Minnow,Carp Family	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1991. Filenko, O.F., D. Shihua, C. Xulong, Z. Yugi, and Z. Tingming. Effect of Mercury on the Relative Proportions of Certain Elements in the Tissues of Carp. Hydrobiol. J.28(4): 62-68.
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	75000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1500	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4500	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	800	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Growth	NR		T	10	NA	NR	ug/L	LAB	1984. Menezes, M.R., and S.Z. Qasim. The Effect of Mercury on the Growth Efficiency of Tilapia mossambica (Peters). Mahasagar17(1): 59-62.
Mercuric nitrate	Mozambique Tilapia	Fish	Fresh	Growth	NR		T	500	NA	NR	ug/L	LAB	1980. Panigrahi, A.K., and B.N. Misra. Toxicological Effects of a Sub-lethal Concentration of Inorganic Mercury on the Fresh Water Fish, Tilapia mossambica, Peters. Arch. Toxicol.44(4): 269-278.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1.38	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1800	NA	NR	ug/L	LAB	1980. Qureshi, S.A., and A.B. Saksena. The Acute Toxicity of Some Heavy Metals to Tilapia mossambica (Peters). Aqua Sci. Tech. Reviews (India)1: 19-20.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	957*	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1000*	NA	NR	ug/L	LAB	1984. Naidu, K.A., and R. Ramamurthi. Acute Effect of Mercury Toxicity on Some Enzymes in Liver of Teleost Sarotherodon mossambicus. Ecotoxicol. Environ. Saf.8(3): 215-218.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1983. Menezes, M.R., and S.Z. Qasim. Determination of Acute Toxicity Levels of Mercury to the Fish Tilapia mossambica (Peters). Proc. Indian Acad. Sci. Anim. Sci.92(5): 375-380.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1100*	NA	NR	ug/L	LAB	1983. Naidu, K.A., and R. Ramamurthi. Histological Observations in Gills of the Teleost Sarotherodon mossambicus with Reference to Mercury Toxicity. Ecotoxicol. Environ. Saf.7(5): 455-462.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1980. Qureshi, S.A., and A.B. Saksena. The Acute Toxicity of Some Heavy Metals to Tilapia mossambica (Peters). Aqua Sci. Tech. Reviews (India)1: 19-20.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	912*	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	935*	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	883*	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	890*	NA	NR	ug/L	LAB	1990. Shaw, B.P., A. Sahu, and A.K. Panigrahi. Comparative Toxicity of an Effluent from a Chlor-Alkali Industry and HgCl2. Bull. Environ. Contam. Toxicol.45(2): 280-287.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., and A.B. Saksena. The Acute Toxicity of Some Heavy Metals to Tilapia mossambica (Peters). Aqua Sci. Tech. Reviews (India)1: 19-20.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	56*	NA	NR	ug/L	LAB	1980. Das, K.K., S.G. Dastidar, S. Chakrabarty, and S.K. Banerjee. Toxicity of Mercury: A Comparative Study in Air-Breathing and Non Air-Breathing Fish. Hydrobiologia68(3): 225-229.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1997. Shrivastava, S., and K.S. Rao. Observation on the Utility of Integrated Aquatic Macrophyte Base System for Mercury Toxicity Removal. Bull. Environ. Contam. Toxicol.59(5): 777-782.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	4	NA	NR	uM	LAB	1991. Siegel, B.Z., S.M. Siegel, T. Correa, C. Dagan, G. Galvez, L. LeeLoy, A. Padua, and E. Yaeger. The Protection of Invertebrates, Fish, and Vascular Plants Against Inorganic Mercury Poisoning by Sulfur and Selenium Derivatives. Arch. Environ. Contam. Toxicol.20(2): 241-246.
Mercury chloride (HgCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	700*	NA	NR	ug/L	LAB	1989. Shrivastava, S., and K.S. Rao. Studies on Activity Recovery in Some Mercury-Exposed Freshwater Fish by Using Selected Weeds. Bull. Environ. Contam. Toxicol.42(6): 840-846.
Mercuric nitrate	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1980. Panigrahi, A.K., and B.N. Misra. Toxicological Effects of a Sub-lethal Concentration of Inorganic Mercury on the Fresh Water Fish, Tilapia mossambica, Peters. Arch. Toxicol.44(4): 269-278.
Mercury chloride (HgCl2)	Mummichog	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1977. Weis, J.S., and P. Weis. Effects of Heavy Metals on Development of the Killifish, Fundulus heterclitus. J. Fish Biol.11(1): 49-54.
Mercury	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	3920	NA	NR	ug/L	LAB	1982. Somsiri, C.. Acute Toxicity of Mercury, Copper and Zinc to the Nile tilapia. Thai Fish. Gaz.35(3): 313-318.
Mercury	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	3800	NA	NR	ug/L	LAB	1982. Somsiri, C.. Acute Toxicity of Mercury, Copper and Zinc to the Nile tilapia. Thai Fish. Gaz.35(3): 313-318.
Mercury	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	3710	NA	NR	ug/L	LAB	1982. Somsiri, C.. Acute Toxicity of Mercury, Copper and Zinc to the Nile tilapia. Thai Fish. Gaz.35(3): 313-318.
Mercury chloride (HgCl2)	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	5525	NR	NR	ug/L	LAB	1993. El-Bouhy, Z., A.M. Alkelch, G. Saleh, and A.M. Ali. Effects of Heavy Metals intoxication on Some Fresh Water Fish. Zag.J.Pharm.Sci.2(2): 73-90.
Mercury chloride (HgCl2)	Nile Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	5525	NR	NR	ug/L	LAB	1993. El-Bouhy, Z., A.M. Alkelch, G. Saleh, and A.M. Ali. Effects of Heavy Metals intoxication on Some Fresh Water Fish. Zag.J.Pharm.Sci.2(2): 73-90.
Ethyl(4-methyl-N-phenylbenzenesulfonamidato-kappaN)mercury	Northern Squawfish	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Northern Squawfish	Fish	Fresh	Mortality	NR	Not Reported	T	7000*	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
Mercury	Orangethroat Darter	Fish	NR	Growth	EC50	Not Reported	T	60.8	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Growth	EC50	Not Reported	T	45	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Growth	EC50	Not Reported	T	40.1	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Growth	EC50	Not Reported	T	40.6	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	EC50	Not Reported	T	49.2	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	EC50	Not Reported	T	72.2	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	EC50	Not Reported	T	35.2	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	EC50	Not Reported	T	48.4	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	EC50	Not Reported	T	21.1	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	EC50	Not Reported	T	34.4	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	EC50	Not Reported	T	18.5	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	EC50	Not Reported	T	34.2	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	LC50	Not Reported	T	93.5	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	LC50	Not Reported	T	64.5	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	LC50	Not Reported	T	60.6	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury	Orangethroat Darter	Fish	NR	Mortality	LC50	Not Reported	T	68.1	NA	NR	ug/L	LAB	1992. Sharp, J.R.. The Effect of Exposure Duration to Mercury on the Development of the Orangethroat Darter, Etheostoma spectabile. Trans. Mo. Acad. Sci.26: 116.
Mercury chloride (HgCl2)	Orangethroat Darter	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1987. Sharp, J.. The Effects of Mercury on the Embryogenesis and Long-Term Survival and Growth of Etheostoma spectabile. Trans. Mo. Acad. Sci.21: 154.
Mercury chloride (HgCl2)	Pearlspot	Fish	Fresh	Mortality	LC50	Not Reported	T	130	NR	NR	ug/L	LAB	1997. Veena, K.B., C.K. Radhakrishnan, and J. Chacko. Heavy Metal Induced Biochemical Effects in an Estuarine Teleost. Indian J. Mar. Sci.26(1): 74-78.
Mercury chloride (HgCl2)	Pearlspot	Fish	Fresh	Mortality	LC50	Not Reported	T	500*	NA	NR	ug/L	LAB	1989. Gaikwad, S.A.. Acute Toxicity of Mercury, Copper and Selenium to the Fish Etroplus maculatus. Environ. Ecol.7(3): 694-696.
Mercury chloride (HgCl2)	Pencil Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100	NA	NR	ug/L	LAB	1995. Oliveira Ribeiro, C.A., L.M. Fernandes, C.S. Carvalho, R.I. Cardoso, and N.M. Turcatti. Acute Effects of Mercuric Chloride on the Olfactory Epithelium of Trichomycterus brasiliensis. Ecotoxicol. Environ. Saf.31(2): 104-109.
Mercury chloride (HgCl2)	Pencil Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100	NA	NR	ug/L	LAB	1995. Oliveira Ribeiro, C.A., and R.F. Torres. Acute Effects Evaluation of HgCl2 on Epidermis of Trichomycterus brasiliensis (Siluroidei; Trichomycteridae). Ecotoxicol. Environ. Saf.32(3): 260-266.
Sulfuric acid, Mercury(2+) salt(1:1)	Pink Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid, Mercury(2+) salt(1:1)	Pink Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid, Mercury(2+) salt(1:1)	Pink Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	210	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid, Mercury(2+) salt(1:1)	Pink Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Mercury	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	410	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	390	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Bleau, H., C. Daniel, G. Chevalier, H. Van Tra, and A. Hontela. Effects of Acute Exposure to Mercury Chloride and Methylmercury on Plasma Cortisol, T3, T4, Glucose and Liver Glycogen in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.34(3): 221-235.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1971. Matida, Y., H. Kumada, S. Kimura, Y. Saiga, T. Nose, M. Yokote, and H. Kawatsu. Toxicity of Mercury Compounds to Aquatic Organisms and Accumulation of the Compounds by the Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)21(2): 197-227.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	1	NR	NR	ug/L	LAB	1984. Boudou, A., and F. Ribeyre. Influence of Exposure Length on the Direct Bioaccumulation of Two Mercury Compounds by Salmo gairdneri (Fry) and the Relationship Between Organism Weight and Mercury Concentrations. Water Res.18(1): 81-86.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	10000	NA	NR	ug/L	LAB	1971. Matida, Y., H. Kumada, S. Kimura, Y. Saiga, T. Nose, M. Yokote, and H. Kawatsu. Toxicity of Mercury Compounds to Aquatic Organisms and Accumulation of the Compounds by the Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)21(2): 197-227.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1971. Matida, Y., H. Kumada, S. Kimura, Y. Saiga, T. Nose, M. Yokote, and H. Kawatsu. Toxicity of Mercury Compounds to Aquatic Organisms and Accumulation of the Compounds by the Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)21(2): 197-227.
Mercury	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13	NA	NR	ug/L	LAB	1973. Calamari, D., and R. Marchetti. The Toxicity of Mixtures of Metals and Surfactants to Rainbow Trout (Salmo gairdneri Rich.). Water Res.7(10): 1453-1464.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	36	NA	NR	ug/L	LAB	1973. Calamari, D., and R. Marchetti. The Toxicity of Mixtures of Metals and Surfactants to Rainbow Trout (Salmo gairdneri Rich.). Water Res.7(10): 1453-1464.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	903	NA	NR	ug/L	LAB	1975. Wobeser, G.. Acute Toxicity of Methyl Mercury Chloride and Mercuric Chloride for Rainbow Trout (Salmo gairdneri) Fry and Fingerlings. J. Fish. Res. Board Can.32(1): 2005-2013.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1973. Calamari, D., and R. Marchetti. The Toxicity of Mixtures of Metals and Surfactants to Rainbow Trout (Salmo gairdneri Rich.). Water Res.7(10): 1453-1464.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	880	NA	NR	ug/L	LAB	1983. Slooff, W., J.H. Canton, and J.L.M. Hermens. Comparison of the Susceptibility of 22 Freshwater Species to 15 Chemical Compounds. I. (Sub)Acute Toxicity Tests. Aquat. Toxicol.4(2): 113-128.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	16	NA	NR	ug/L	LAB	1973. Calamari, D., and R. Marchetti. The Toxicity of Mixtures of Metals and Surfactants to Rainbow Trout (Salmo gairdneri Rich.). Water Res.7(10): 1453-1464.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	420	NR	NR	ug/L	LAB	1981. Daoust, P.Y.. Acute Pathological Effects of Mercury, Cadmium and Copper in Rainbow Trout. Ph.D.Thesis, Saskatoon, Saskatchewan: 331 p..
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	160*	NA	NR	ug/L	LAB	1982. Qureshi, A.A., K.W. Flood, S.R. Thompson, S.M. Janhurst, C.S. Inniss, and D.A. Rokosh. Comparison of a Luminescent Bacterial Test with Other Bioassays for Determining Toxicity of Pure Compounds and Complex Effluents. In: J.G.Pearson, R.B.Foster and W.E.Bishop (Eds.), Aquatic Toxicology and Hazard Assessment, 5th Confrence, ASTM STP 766, Philadelphia, PA: 179-195.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	193	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	217	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NR	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. A Continuous Flow System Using Fish and Amphibian Eggs for Bioassay Determinations on Embryonic Mortality and Teratogenesis. EPA 560/5-77-002, U.S.EPA, Washington, D.C.: 71 p..
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4.7	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Nitric acid, Mercury (1+) salt, Monohydrate	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	33	NR	NR	ug/L	LAB	1977. Hale, J.G.. Toxicity of Metal Mining Wastes. Bull. Environ. Contam. Toxicol.17(1): 66-73.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Methyl mercury(1+), Ion	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	310	NA	NR	ug/L	LAB	1971. Matida, Y., H. Kumada, S. Kimura, Y. Saiga, T. Nose, M. Yokote, and H. Kawatsu. Toxicity of Mercury Compounds to Aquatic Organisms and Accumulation of the Compounds by the Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)21(2): 197-227.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	750	NA	NR	ug/L	LAB	1973. MacLeod, J.C., and E. Pessah. Temperature Effects on Mercury Accumulation, Toxicity, and Metabolic Rate in Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.30: 485-492.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	220	NA	NR	ug/L	LAB	1971. Matida, Y., H. Kumada, S. Kimura, Y. Saiga, T. Nose, M. Yokote, and H. Kawatsu. Toxicity of Mercury Compounds to Aquatic Organisms and Accumulation of the Compounds by the Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)21(2): 197-227.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	300	NA	NR	ug/L	LAB	1973. MacLeod, J.C., and E. Pessah. Temperature Effects on Mercury Accumulation, Toxicity, and Metabolic Rate in Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.30: 485-492.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	450	NA	NR	ug/L	LAB	1973. MacLeod, J.C., and E. Pessah. Temperature Effects on Mercury Accumulation, Toxicity, and Metabolic Rate in Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.30: 485-492.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	650	NA	NR	ug/L	LAB	1973. MacLeod, J.C., and E. Pessah. Temperature Effects on Mercury Accumulation, Toxicity, and Metabolic Rate in Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.30: 485-492.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	210	NA	NR	ug/L	LAB	1971. Matida, Y., H. Kumada, S. Kimura, Y. Saiga, T. Nose, M. Yokote, and H. Kawatsu. Toxicity of Mercury Compounds to Aquatic Organisms and Accumulation of the Compounds by the Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)21(2): 197-227.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	210	NA	NR	ug/L	LAB	1971. Matida, Y., H. Kumada, S. Kimura, Y. Saiga, T. Nose, M. Yokote, and H. Kawatsu. Toxicity of Mercury Compounds to Aquatic Organisms and Accumulation of the Compounds by the Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)21(2): 197-227.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	220	NA	NR	ug/L	LAB	1973. MacLeod, J.C., and E. Pessah. Temperature Effects on Mercury Accumulation, Toxicity, and Metabolic Rate in Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.30: 485-492.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	280	NA	NR	ug/L	LAB	1973. MacLeod, J.C., and E. Pessah. Temperature Effects on Mercury Accumulation, Toxicity, and Metabolic Rate in Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.30: 485-492.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	400	NA	NR	ug/L	LAB	1973. MacLeod, J.C., and E. Pessah. Temperature Effects on Mercury Accumulation, Toxicity, and Metabolic Rate in Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.30: 485-492.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	210	NA	NR	ug/L	LAB	1971. Matida, Y., H. Kumada, S. Kimura, Y. Saiga, T. Nose, M. Yokote, and H. Kawatsu. Toxicity of Mercury Compounds to Aquatic Organisms and Accumulation of the Compounds by the Organisms. Bull. Freshw. Fish. Res. Lab. (Tokyo)21(2): 197-227.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	LD50	Not Reported	T	300	NA	NR	ug/L	LAB	1972. Guerra, M., and N. Comodo. Possibilita' di Utilizzazione del Test di Ittiotossicita' per una Valutazione dei Limiti di Accettabilita' Negli Effluenti Industriali di Alcune Sost. Boll. Soc. Ital. Biol. Sper.48(22): 898-901.
Mercury	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Mercury	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	150	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1960. Boetius, J.. Lethal Action of Mercuric Chloride and Phenylmercuric Acetate on Fishes. Medd. Dan. Fisk. Havunders.3(4): 93-115.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Niimi, A.J., and G.P. Kissoon. Evaluation of the Critical Body Burden Concept Based on Inorganic and Organic Mercury Toxicity to Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.26(2): 169-178.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	0.13	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	0.21	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	0.12	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1983. Klaverkamp, J.F., W.A. MacDonald, W.R. Lillie, and A. Lutz. Joint Toxicity of Mercury and Selenium in Salmonid Eggs. Arch. Environ. Contam. Toxicol.12: 415-419.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1983. Klaverkamp, J.F., W.A. MacDonald, W.R. Lillie, and A. Lutz. Joint Toxicity of Mercury and Selenium in Salmonid Eggs. Arch. Environ. Contam. Toxicol.12: 415-419.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1983. Klaverkamp, J.F., W.A. MacDonald, W.R. Lillie, and A. Lutz. Joint Toxicity of Mercury and Selenium in Salmonid Eggs. Arch. Environ. Contam. Toxicol.12: 415-419.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1983. Klaverkamp, J.F., W.A. MacDonald, W.R. Lillie, and A. Lutz. Joint Toxicity of Mercury and Selenium in Salmonid Eggs. Arch. Environ. Contam. Toxicol.12: 415-419.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	3000	NA	NR	ug/L	LAB	1983. Klaverkamp, J.F., W.A. MacDonald, W.R. Lillie, and A. Lutz. Joint Toxicity of Mercury and Selenium in Salmonid Eggs. Arch. Environ. Contam. Toxicol.12: 415-419.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1983. Klaverkamp, J.F., W.A. MacDonald, W.R. Lillie, and A. Lutz. Joint Toxicity of Mercury and Selenium in Salmonid Eggs. Arch. Environ. Contam. Toxicol.12: 415-419.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1983. Klaverkamp, J.F., W.A. MacDonald, W.R. Lillie, and A. Lutz. Joint Toxicity of Mercury and Selenium in Salmonid Eggs. Arch. Environ. Contam. Toxicol.12: 415-419.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1983. Klaverkamp, J.F., W.A. MacDonald, W.R. Lillie, and A. Lutz. Joint Toxicity of Mercury and Selenium in Salmonid Eggs. Arch. Environ. Contam. Toxicol.12: 415-419.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	26	NA	NR	ug/L	LAB	1977. Hodson, P.V., B.R. Blunt, D.J. Spry, and K. Austen. Evaluation of Erythrocyte delta-Amino Levulinic Acid Dehydratase Activity as a Short-Term Indicator in Fish of a Harmful Exposure to Lead. J. Fish. Res. Board Can.34(4): 501-508.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1	NA	NR	ug/L	LAB	1974. Birge, W.J., A.G. Westerman, and O.W. Roberts. Lethal and Teratogenic Effects of Metallic Pollutants on Vertebrate Embryos. In: Proc. 2nd Annu. NSF-Rann Trace Contam. Environ. Conf. , Springfield, VA: 316-320.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	7	NA	NR	ug/L	LAB	1974. Birge, W.J., A.G. Westerman, and O.W. Roberts. Lethal and Teratogenic Effects of Metallic Pollutants on Vertebrate Embryos. In: Proc. 2nd Annu. NSF-Rann Trace Contam. Environ. Conf. , Springfield, VA: 316-320.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1983. Klaverkamp, J.F., W.A. MacDonald, W.R. Lillie, and A. Lutz. Joint Toxicity of Mercury and Selenium in Salmonid Eggs. Arch. Environ. Contam. Toxicol.12: 415-419.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1983. Klaverkamp, J.F., W.A. MacDonald, W.R. Lillie, and A. Lutz. Joint Toxicity of Mercury and Selenium in Salmonid Eggs. Arch. Environ. Contam. Toxicol.12: 415-419.
Mercury	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	800	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	350	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	250	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	64	NA	NR	ug/L	LAB	1994. Niimi, A.J., and G.P. Kissoon. Evaluation of the Critical Body Burden Concept Based on Inorganic and Organic Mercury Toxicity to Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.26(2): 169-178.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50	NA	NR	ug/L	LAB	1974. Birge, W.J., A.G. Westerman, and O.W. Roberts. Lethal and Teratogenic Effects of Metallic Pollutants on Vertebrate Embryos. In: Proc. 2nd Annu. NSF-Rann Trace Contam. Environ. Conf. , Springfield, VA: 316-320.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	426	NA	NR	ug/L	LAB	1994. Niimi, A.J., and G.P. Kissoon. Evaluation of the Critical Body Burden Concept Based on Inorganic and Organic Mercury Toxicity to Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.26(2): 169-178.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	241	NA	NR	ug/L	LAB	1994. Niimi, A.J., and G.P. Kissoon. Evaluation of the Critical Body Burden Concept Based on Inorganic and Organic Mercury Toxicity to Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.26(2): 169-178.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	135	NA	NR	ug/L	LAB	1994. Niimi, A.J., and G.P. Kissoon. Evaluation of the Critical Body Burden Concept Based on Inorganic and Organic Mercury Toxicity to Rainbow Trout (Oncorhynchus mykiss). Arch. Environ. Contam. Toxicol.26(2): 169-178.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50	NR	NR	ug/L	LAB	1977. Birge, W.J., and J.A. Black. A Continuous Flow System Using Fish and Amphibian Eggs for Bioassay Determinations on Embryonic Mortality and Teratogenesis. EPA 560/5-77-002, U.S.EPA, Washington, D.C.: 71 p..
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	0.57	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	0.05	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Methyl mercury(1+), Ion	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Bleau, H., C. Daniel, G. Chevalier, H. Van Tra, and A. Hontela. Effects of Acute Exposure to Mercury Chloride and Methylmercury on Plasma Cortisol, T3, T4, Glucose and Liver Glycogen in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.34(3): 221-235.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3.04	NA	NR	ug/L	LAB	1995. Handy, R.D.. Comparison of Intermittent and Continuous Exposure to Mercuric Chloride in Rainbow Trout (Oncorhynchus mykiss), Goldfish (Carassius auratus), and the. Can. J. Fish. Aquat. Sci.52(1): 13-22.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Handy, R.D.. Comparison of Intermittent and Continuous Exposure to Mercuric Chloride in Rainbow Trout (Oncorhynchus mykiss), Goldfish (Carassius auratus), and the. Can. J. Fish. Aquat. Sci.52(1): 13-22.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Reproduction	NR		T	1000	NA	NR	ug/L	LAB	1985. Billard, R., and P. Roubaud. The Effect of Metals and Cyanide on Fertilization in Rainbow Trout (Salmo gairdneri). Water Res.19(2): 209-214.
Mercury chloride (HgCl2)	Rainbow Trout	Fish	Fresh	Reproduction	NR		T	50	NA	NR	ug/L	LAB	1985. Billard, R., and P. Roubaud. The Effect of Metals and Cyanide on Fertilization in Rainbow Trout (Salmo gairdneri). Water Res.19(2): 209-214.
Mercury chloride (HgCl2)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	128	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Mercury chloride (HgCl2)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1997. Buhl, K.J.. Relative Sensitivity of Three Endangered Fishes, Colorado Squawfish, Bonytail, and Razorback Sucker, to Selected Metal Pollutants. Ecotoxicol. Environ. Saf.37: 186-192.
Mercury chloride (HgCl2)	Redear Sunfish	Fish	Fresh	Mortality	LC50	Not Reported	T	137.2	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Redear Sunfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury chloride (HgCl2)	Rock Bass	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1960. Boetius, J.. Lethal Action of Mercuric Chloride and Phenylmercuric Acetate on Fishes. Medd. Dan. Fisk. Havunders.3(4): 93-115.
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	16.3	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	16.8	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	17.2	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	17.8	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	18.3	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	18.6	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	19.1	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	19.7	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	20.7	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	21.1	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	21.5	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.
Mercury	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	21.7	NR	NR	ug/L	LAB	1998. Jagadeesan, G., and S. Vijayalakshmi. Evaluation of Mercury Toxicity on the Fish Labeo rohita (Ham.) Fingerlings in a Calendar Year. Environ. Ecol.16(4): 885-890.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	300*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	230*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	530	NR	NR	ug/L	LAB	2002. Aditya, A.K., S. Chattopadhyay, and S. Mitra. Effect of Mercury and Methyl Parathion on the Ovaries of Labeo rohita (Ham). J. Environ. Biol.23(1): 61-64.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	150.5	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	17.2	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	175.5	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	18.2	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	18.8	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	21.8	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	210.2	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	22.2	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	23.7	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	24.2	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	255.7	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	27.1	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	30.1	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	310.2	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	320.5	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	33.18	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	40.3	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	75.01	NA	NR	ug/L	LAB	1995. Chattopadhyay, S., K. Anam, and A.K. Aditya. Bioassay Evalution of Acute Toxicity Levels of Mercuric Chloride and Cadmium Chloride on the Early Growing Stages of Labeo rohita. J.Ecobiol.7(1): 41-47.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	130*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	3850*	NA	NR	ug/L	LAB	1980. Deshmukh, S.S., and V.B. Marathe. Size Related Toxicity of Copper and Mercury to Lebistes reticulatus (Peter), Labeo rohita (Ham.) and Cyprinus carpio Linn. Indian J. Exp. Biol.18: 421-423.
Mercury chloride (HgCl2)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	48000*	NA	NR	ug/L	LAB	1980. Deshmukh, S.S., and V.B. Marathe. Size Related Toxicity of Copper and Mercury to Lebistes reticulatus (Peter), Labeo rohita (Ham.) and Cyprinus carpio Linn. Indian J. Exp. Biol.18: 421-423.
Mercury chloride (HgCl2)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	134.7*	NA	NR	ug/L	LAB	1981. Gill, T.S., and J.C. Pant. Effects of Sublethal Concentrations of Mercury in a Teleost Puntius conchonius: Biochemical and Haematological Responses. Indian J. Exp. Biol.19(6): 571-573.
Mercury chloride (HgCl2)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	50.8*	NA	NR	ug/L	LAB	1981. Gill, T.S., and J.C. Pant. Effects of Sublethal Concentrations of Mercury in a Teleost Puntius conchonius: Biochemical and Haematological Responses. Indian J. Exp. Biol.19(6): 571-573.
Mercury chloride (HgCl2)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	7.86*	NA	NR	ug/L	LAB	1981. Gill, T.S., and J.C. Pant. Effects of Sublethal Concentrations of Mercury in a Teleost Puntius conchonius: Biochemical and Haematological Responses. Indian J. Exp. Biol.19(6): 571-573.
Mercury chloride (HgCl2)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	74.9*	NA	NR	ug/L	LAB	1981. Gill, T.S., and J.C. Pant. Effects of Sublethal Concentrations of Mercury in a Teleost Puntius conchonius: Biochemical and Haematological Responses. Indian J. Exp. Biol.19(6): 571-573.
Mercury chloride (HgCl2)	Smooth-Breasted Snakefish	Fish	Fresh	Mortality	LC50	Not Reported	T	3000*	NA	NR	ug/L	LAB	1979. Hanumante, M.M., and S.S. Kulkarni. Acute Toxicity of Two Molluscicides, Mercuric Chloride and Pentachlorophenol to a Freshwater Fish (Channa gachua). Bull. Environ. Contam. Toxicol.23(6): 725-727.
Mercury chloride (HgCl2)	Smooth-Breasted Snakefish	Fish	Fresh	Mortality	LC50	Not Reported	T	1600*	NA	NR	ug/L	LAB	1979. Hanumante, M.M., and S.S. Kulkarni. Acute Toxicity of Two Molluscicides, Mercuric Chloride and Pentachlorophenol to a Freshwater Fish (Channa gachua). Bull. Environ. Contam. Toxicol.23(6): 725-727.
Mercury chloride (HgCl2)	Smooth-Breasted Snakefish	Fish	Fresh	Mortality	LC50	Not Reported	T	1200*	NA	NR	ug/L	LAB	1979. Hanumante, M.M., and S.S. Kulkarni. Acute Toxicity of Two Molluscicides, Mercuric Chloride and Pentachlorophenol to a Freshwater Fish (Channa gachua). Bull. Environ. Contam. Toxicol.23(6): 725-727.
Mercury chloride (HgCl2)	Smooth-Breasted Snakefish	Fish	Fresh	Mortality	LC50	Not Reported	T	1000*	NA	NR	ug/L	LAB	1979. Hanumante, M.M., and S.S. Kulkarni. Acute Toxicity of Two Molluscicides, Mercuric Chloride and Pentachlorophenol to a Freshwater Fish (Channa gachua). Bull. Environ. Contam. Toxicol.23(6): 725-727.
Mercury	Snake-Head Catfish	Fish	Fresh	Growth	NR		T	5000	NA	NR	ug/L	NR	1987. Jana, S.R., and N. Bandyopadhyaya. Effect of Heavy Metals on Some Biochemical Parameters in the Freshwater Fish Channa punctatus. Aquat. Sci. Fish. Abstr.18(4): 5486-1Q18.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Growth	NR		T	2*	NA	NR	ug/L	LAB	1984. Sastry, K.V., and D.R. Rao. Effect of Mercuric Chloride on Some Biochemical and Physiological Parameters of the Freshwater Murrel, Channa punctatus. Environ. Res.34(2): 343-350.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC0*	Not Reported	T	220*	NA	NR	ug/L	LAB	1979. Sastry, K.V., P.K. Gupta, and P.V. Malik. A Comparative Study of the Effect of Acute and Chronic Mercuric Chloride Treatment on the Activities of a Few Digestive Enzymes of a Teleost. Bull. Environ. Contam. Toxicol.22(1-2): 28-34.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	941	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	860	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	131	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	432	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	314	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1880*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2014*	NA	NR	ug/L	LAB	1991. Agarwal, S.K.. Bioassay Evaluation of Acute Toxicity Levels of Mercuric Chloride to an Air-Breathing Fish Channa punctatus (Bloch): Mortality and Behaviour Study. J. Environ. Biol.12(2): 99-106.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1150	NA	NR	ug/L	LAB	1997. Banerjee, S., and S. Bhattacharya. Histopathological Changes Induced by Chronic Nonlethal Levels of Elsan, Mercury and Ammonia in the Liver of Channa punctatus (Bloch). J. Environ. Biol.18(2): 141-148.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1110	NA	NR	ug/L	LAB	1991. Mitra, S.. C-Reactive Protein in the Freshwater Teleost, Channa punctatus: Interaction with Xenobiotics. Ph.D.Thesis (Synopsis), Visva-Bharah Univ., Santiniketan, India: 4 p..
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1330*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1863*	NA	NR	ug/L	LAB	1991. Agarwal, S.K.. Bioassay Evaluation of Acute Toxicity Levels of Mercuric Chloride to an Air-Breathing Fish Channa punctatus (Bloch): Mortality and Behaviour Study. J. Environ. Biol.12(2): 99-106.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1040*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1699*	NA	NR	ug/L	LAB	1991. Agarwal, S.K.. Bioassay Evaluation of Acute Toxicity Levels of Mercuric Chloride to an Air-Breathing Fish Channa punctatus (Bloch): Mortality and Behaviour Study. J. Environ. Biol.12(2): 99-106.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1150	NR	NR	ug/L	LAB	2005. Pandey, S., R. Kumar, S. Sharma, N.S. Nagpure, S.K. Srivastava, and M.S. Verma. Acute Toxicity Bioassays of Mercuric Chloride and Malathion on Air-Breathing Fish Channa punctatus (Bloch). Ecotoxicol. Environ. Saf.61(1): 114-120.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1210	NR	NR	ug/L	LAB	2005. Pandey, S., R. Kumar, S. Sharma, N.S. Nagpure, S.K. Srivastava, and M.S. Verma. Acute Toxicity Bioassays of Mercuric Chloride and Malathion on Air-Breathing Fish Channa punctatus (Bloch). Ecotoxicol. Environ. Saf.61(1): 114-120.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2032	NA	NR	ug/L	LAB	1986. Saksena, D.N., and A. Agarwal. Effect of Mercuric Chloride intoxication on Ovarian Activity of a Teleostean Fish, Channa punctatus (Bloch). Int. J. Acad. Ichthyol.7(1): 1-6.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1300*	NA	NR	ug/L	LAB	1980. Sastry, K.V., and K. Sharma. Effects of Mercuric Chloride on the Activities of Brain Enzymes in a Fresh Water Teleost, Ophiocephalus (Channa) punctatus. Arch. Environ. Contam. Toxicol.9(4): 425-430.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1300*	NA	NR	ug/L	LAB	1980. Sastry, K.V., and P.K. Gupta. Changes in the Activities of Some Digestive Enzymes of Channa punctatus, Exposed Chronically to Mercuric Chloride. J. Environ. Sci. Health B15(1): 109-119.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1150	NA	NR	ug/L	LAB	1994. Dalal, R., and S. Bhattacharya. Effect of Cadmium, Mercury, and Zinc on the Hepatic Microsomal Enzymes of Channa punctatus. Bull. Environ. Contam. Toxicol.52(6): 893-897.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1300*	NA	NR	ug/L	LAB	1981. Gupta, P.K., and K.V. Sastry. Alterations in the Activities of Three Dehydrogenases in the Digestive System of Two Teleost Fishes Exposed to Mercuric Chloride. Environ. Res.24: 15-23.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1300*	NA	NR	ug/L	LAB	1979. Sastry, K.V., P.K. Gupta, and P.V. Malik. A Comparative Study of the Effect of Acute and Chronic Mercuric Chloride Treatment on the Activities of a Few Digestive Enzymes of a Teleost. Bull. Environ. Contam. Toxicol.22(1-2): 28-34.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1300*	NA	NR	ug/L	LAB	1979. Sastry, K.V., and M.K. Agrawal. Mercuric Chloride Induced Enzymological Changes in Kidney and Ovary of a Teleost Fish, Channa punctatus. Bull. Environ. Contam. Toxicol.22(1/2): 38-43.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1300*	NA	NR	ug/L	LAB	1978. Sastry, K.V., and P.K. Gupta. Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa punctatus. Bull. Environ. Contam. Toxicol.20(3): 353-360.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1567*	NA	NR	ug/L	LAB	1991. Agarwal, S.K.. Bioassay Evaluation of Acute Toxicity Levels of Mercuric Chloride to an Air-Breathing Fish Channa punctatus (Bloch): Mortality and Behaviour Study. J. Environ. Biol.12(2): 99-106.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	670*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Mercury	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	6148	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Mercury	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	4602	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Mercury	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	3787	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Mercury	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	1571	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Mercury	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	6355	NA	NR	ug/L	LAB	1991. Gopal, V., and K. Maheswari Devi. Influence of Nutritional Status on the Median Tolerance Limits (LC50) of Ophiocephalus striatus for Certain Heavy Metal and Pesticide Toxicants. Indian J. Environ. Health33(3): 393-394.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	NR	Mortality	LC50	Not Reported	T	760	NA	NR	ug/L	NR	1990. Singh, A., and J.S.D. Munshi. The Effects of Heavy Metals on Gills of Fishes: A Morphometric Study. J. Freshw. Biol.2(1): 69-72.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	12.4*	NA	NR	ug/L	LAB	1989. Dey, S., and S. Bhattacharya. Ovarian Damage to Channa punctatus After Chronic Exposure to Low Concentrations of Elsan, Mercury, and Ammonia. Ecotoxicol. Environ. Saf.17(2): 247-257.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	1300*	NA	NR	ug/L	LAB	1978. Sastry, K.V., and P.K. Gupta. Effect of Mercuric Chloride on the Digestive System of Channa punctatus: A Histopathological Study. Environ. Res.16(3): 270-278.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Juneja, C.J., and C.L. Mahajan. Haematological and Haemopoietic Changes in Fish Channa punctatus due to Mercury Pollution in Water. Indian J. Anim. Res.17(2): 63-71.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	101*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	75*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	2*	NA	NR	ug/L	LAB	1984. Sastry, K.V., and D.R. Rao. Effect of Mercuric Chloride on Some Biochemical and Physiological Parameters of the Freshwater Murrel, Channa punctatus. Environ. Res.34(2): 343-350.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	21*	NA	NR	ug/L	LAB	1984. Sastry, K.V., and D.R. Rao. Effect of Mercuric Chloride on Some Biochemical and Physiological Parameters of the Freshwater Murrel, Channa punctatus. Environ. Res.34(2): 343-350.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	101*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	50*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	75*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	200*	NA	NR	ug/L	LAB	1980. Sastry, K.V., and K. Sharma. Effects of Mercuric Chloride on the Activities of Brain Enzymes in a Fresh Water Teleost, Ophiocephalus (Channa) punctatus. Arch. Environ. Contam. Toxicol.9(4): 425-430.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	200*	NA	NR	ug/L	LAB	1980. Sastry, K.V., and P.K. Gupta. Changes in the Activities of Some Digestive Enzymes of Channa punctatus, Exposed Chronically to Mercuric Chloride. J. Environ. Sci. Health B15(1): 109-119.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	101*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	25*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	50*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	75*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	220*	NA	NR	ug/L	LAB	1978. Sastry, K.V., and P.K. Gupta. Effect of Mercuric Chloride on the Digestive System of Channa punctatus: A Histopathological Study. Environ. Res.16(3): 270-278.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	101*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	75*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	25*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	50*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	101*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	50*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	75*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	75*	NA	NR	ug/L	LAB	1984. Sharma, K.C.. Effect of Mercury Pollution on the General Biology and Carbohydrate Metabolism of a Freshwater Murrel, Channa punctatus (Bloch.). Geobios (Jodhpur)11(3): 122-127.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	NR	Mortality	NR-LETH	Not Reported	T	740*	NA	NR	ug/L	LAB	1987. Mumtaz, A.. Behavioral Toxicology. I: Channa punctatus Under Mercury Stress. C. A. Sel. - Environ. Pollut.11: 106-170420M.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	NR	Mortality	NR-LETH	Not Reported	T	3700*	NA	NR	ug/L	LAB	1987. Mumtaz, A.. Behavioral Toxicology. I: Channa punctatus Under Mercury Stress. C. A. Sel. - Environ. Pollut.11: 106-170420M.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	16.7	NA	NR	ug/L	LAB	1997. Banerjee, S., and S. Bhattacharya. Histopathological Changes Induced by Chronic Nonlethal Levels of Elsan, Mercury and Ammonia in the Liver of Channa punctatus (Bloch). J. Environ. Biol.18(2): 141-148.
Mercury chloride (HgCl2)	Snake-Head Catfish	Fish	Fresh	Reproduction	NR	Ovaries	T	100	NA	NR	ug/L	LAB	1986. Saksena, D.N., and A. Agarwal. Effect of Mercuric Chloride intoxication on Ovarian Activity of a Teleostean Fish, Channa punctatus (Bloch). Int. J. Acad. Ichthyol.7(1): 1-6.
Sulfuric acid, Mercury(2+) salt(1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid, Mercury(2+) salt(1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid, Mercury(2+) salt(1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid, Mercury(2+) salt(1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid, Mercury(2+) salt(1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid, Mercury(2+) salt(1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Sulfuric acid, Mercury(2+) salt(1:1)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	310	NA	NR	ug/L	LAB	1978. Servizi, J.A., and D.W. Martens. Effects of Selected Heavy Metals on Early Life of Sockeye and Pink Salmon. Rep.No.39, Int.Pacific Salmon Fish.Comm.(Br.Col.): 26 p..
Mercury	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury chloride (HgCl2)	Striped Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	760	NA	NR	ug/L	LAB	1989. Dutt, D., and A.K. Sharma. Toxicity and Respiratory Effects of Mercuric Chloride(HgCl2) and Methyl Mercuric Chloride(CH3HgCl) on Catfish, Mystus vittatus. Uttar Pradesh J. Zool.9(1): 43-47.
Mercury chloride (HgCl2)	Striped Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	600	NA	NR	ug/L	LAB	1989. Dutt, D., and A.K. Sharma. Toxicity and Respiratory Effects of Mercuric Chloride(HgCl2) and Methyl Mercuric Chloride(CH3HgCl) on Catfish, Mystus vittatus. Uttar Pradesh J. Zool.9(1): 43-47.
Mercury chloride (HgCl2)	Striped Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	520	NA	NR	ug/L	LAB	1989. Dutt, D., and A.K. Sharma. Toxicity and Respiratory Effects of Mercuric Chloride(HgCl2) and Methyl Mercuric Chloride(CH3HgCl) on Catfish, Mystus vittatus. Uttar Pradesh J. Zool.9(1): 43-47.
Mercury chloride (HgCl2)	Striped Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	440	NA	NR	ug/L	LAB	1989. Dutt, D., and A.K. Sharma. Toxicity and Respiratory Effects of Mercuric Chloride(HgCl2) and Methyl Mercuric Chloride(CH3HgCl) on Catfish, Mystus vittatus. Uttar Pradesh J. Zool.9(1): 43-47.
Mercury	Tench	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1500	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1300	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1500	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1100	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Mercury chloride (HgCl2)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1960. Boetius, J.. Lethal Action of Mercuric Chloride and Phenylmercuric Acetate on Fishes. Medd. Dan. Fisk. Havunders.3(4): 93-115.
Mercury chloride (HgCl2)	Threespine Stickleback	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Mercury chloride (HgCl2)	Threespine Stickleback	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Mercury chloride (HgCl2)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	3100*	NA	NR	ug/L	LAB	1986. El Sebae, A.H., M.A. El Amayem, I. Sharaf, and M. Massod. Factors Affecting Acute and Chronic Toxicity of Chlorinated Pesticides and Their Biomagnification in Alexandria Region. In: Papers Presented at the FAO/UNEP Meeting on the Toxicity and Bioaccumulation of Selected Substances in Marine Organisms, Rovinj, Yugoslavia, 5-9 Nov., 1984, FAO Fish.Rep.No.334(suppl.): 73-79.
Mercury chloride (HgCl2)	Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	30000	NR	NR	ug/L	LAB	1960. Boetius, J.. Lethal Action of Mercuric Chloride and Phenylmercuric Acetate on Fishes. Medd. Dan. Fisk. Havunders.3(4): 93-115.
Mercury chloride (HgCl2)	Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Boetius, J.. Lethal Action of Mercuric Chloride and Phenylmercuric Acetate on Fishes. Medd. Dan. Fisk. Havunders.3(4): 93-115.
Mercury chloride (HgCl2)	Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1960. Boetius, J.. Lethal Action of Mercuric Chloride and Phenylmercuric Acetate on Fishes. Medd. Dan. Fisk. Havunders.3(4): 93-115.
Mercury chloride (HgCl2)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	398	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. The Toxic Effects of Mercury Ions on a Freshwater Teleost, Puntius sophore (Hamilton), as Assessed by Bioassay and Histopathological Indices. Acta Hydrochim. Hydrobiol.9(4): 391-400.
Mercury chloride (HgCl2)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	241	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. The Toxic Effects of Mercury Ions on a Freshwater Teleost, Puntius sophore (Hamilton), as Assessed by Bioassay and Histopathological Indices. Acta Hydrochim. Hydrobiol.9(4): 391-400.
Mercury chloride (HgCl2)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	65	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. The Toxic Effects of Mercury Ions on a Freshwater Teleost, Puntius sophore (Hamilton), as Assessed by Bioassay and Histopathological Indices. Acta Hydrochim. Hydrobiol.9(4): 391-400.
Mercury chloride (HgCl2)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	165	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. The Toxic Effects of Mercury Ions on a Freshwater Teleost, Puntius sophore (Hamilton), as Assessed by Bioassay and Histopathological Indices. Acta Hydrochim. Hydrobiol.9(4): 391-400.
Mercury chloride (HgCl2)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	145	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. The Toxic Effects of Mercury Ions on a Freshwater Teleost, Puntius sophore (Hamilton), as Assessed by Bioassay and Histopathological Indices. Acta Hydrochim. Hydrobiol.9(4): 391-400.
Mercury chloride (HgCl2)	Two Spot Barb, Dotted Barb	Fish	NR	Mortality	NR	Not Reported	T	250	NA	NR	ug/L	LAB	1980. Khangarot, B.S., and R.C. Somani. Toxic Effects of Mercury on the Gills of a Freshwater Teleost, Puntius sophore Hamilton. Curr. Sci. (Bangalore)49(21): 832-834.
Mercury chloride (HgCl2)	Two Spot Barb, Dotted Barb	Fish	NR	Mortality	NR	Not Reported	T	250	NA	NR	ug/L	LAB	1980. Khangarot, B.S., and R.C. Somani. Toxic Effects of Mercury on the Gills of a Freshwater Teleost, Puntius sophore Hamilton. Curr. Sci. (Bangalore)49(21): 832-834.
Mercury chloride (HgCl2)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	190*	NA	NR	ug/L	LAB	1989. Shrivastava, S., and K.S. Rao. Studies on Activity Recovery in Some Mercury-Exposed Freshwater Fish by Using Selected Weeds. Bull. Environ. Contam. Toxicol.42(6): 840-846.
Mercury chloride (HgCl2)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1982. Saxena, A.B., D.S. Rao, and Z.U. Khan. Studies on the Acute Toxicities of Copper, Mercury, and Cadmium to Danio malabaricus and Puntius ticto. J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control17(5): 657-665.
Mercury chloride (HgCl2)	Walking Catfish	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	T	500	NA	NR	ug/L	LAB	1986. Sahana, S.S., S. Jana, M.A. Choudhuri, and D.K. Choudhuri. Hg [II]-Induced Changes in Some Biochemical Parameters in the Freshwater Fish Clarias batrachus. Physiol. Bohemoslov.35(1): 81-85.
Mercury chloride (HgCl2)	Walking Catfish	Fish	NR	Mortality	LC100	Not Reported	T	2	NA	NR	ml	LAB	1979. Saxena, R., and A.P. Tyagi. Effect of Mercuric Chloride on the Phosphatases in the Accessory Respiratory Organs of Clarias batrachus. Hydrobiologia63(3): 209-211.
Mercury chloride (HgCl2)	Walking Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	930*	NA	NR	ug/L	LAB	1988. Kirubagaran, R., and K.P. Joy. Toxic Effects of Three Mercurial Compounds on Survival, and Histology of the Kidney of the Catfish Clarias batrachus (L.). Ecotoxicol. Environ. Saf.15(2): 171-179.
Mercury chloride (HgCl2)	Walking Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	690*	NA	NR	ug/L	LAB	1988. Kirubagaran, R., and K.P. Joy. Toxic Effects of Three Mercurial Compounds on Survival, and Histology of the Kidney of the Catfish Clarias batrachus (L.). Ecotoxicol. Environ. Saf.15(2): 171-179.
Mercury chloride (HgCl2)	Walking Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	510*	NA	NR	ug/L	LAB	1988. Kirubagaran, R., and K.P. Joy. Toxic Effects of Three Mercurial Compounds on Survival, and Histology of the Kidney of the Catfish Clarias batrachus (L.). Ecotoxicol. Environ. Saf.15(2): 171-179.
Mercury chloride (HgCl2)	Walking Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	380*	NA	NR	ug/L	LAB	1988. Kirubagaran, R., and K.P. Joy. Toxic Effects of Three Mercurial Compounds on Survival, and Histology of the Kidney of the Catfish Clarias batrachus (L.). Ecotoxicol. Environ. Saf.15(2): 171-179.
Mercury chloride (HgCl2)	Walking Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	umol/L	LAB	1989. Jana, S., and S.S. Sahana. Sensitivity of the Freshwater Fishes Clarias batrachus and Anabas testudineus to Heavy Metals. Environ. Ecol.7(2): 265-270.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Walking Catfish	Fish	Fresh	Reproduction	NR		T	40*	NA	NR	ug/L	LAB	1988. Kirubagaran, R., and K.P. Joy. Toxic Effects of Mercuric Chloride, Methylmercuric Chloride, and Emisan 6 (an Organic Mercurial Fungicide) on Ovarian Recrudescence in the Catfish Cl. Bull. Environ. Contam. Toxicol.41(6): 902-909.
Methyl mercury(1+), Ion	Walleye	Fish	Fresh	Growth	NR	Not Reported	T	987	NA	NR	ug/L	LAB	1996. Friedmann, A.S., M.C. Watzin, T. Brinck-Johnsen, and J.C. Leiter. Low Levels of Dietary Methylmercury Inhibit Growth and Gonadal Development in Juvenile Walleye (Stizostedion vitreum). Aquat. Toxicol.35(3-4): 265-278.
Methyl mercury(1+), Ion	Walleye	Fish	Fresh	Growth	NR	Not Reported	T	137	NA	NR	ug/L	LAB	1996. Friedmann, A.S., M.C. Watzin, T. Brinck-Johnsen, and J.C. Leiter. Low Levels of Dietary Methylmercury Inhibit Growth and Gonadal Development in Juvenile Walleye (Stizostedion vitreum). Aquat. Toxicol.35(3-4): 265-278.
Methyl mercury(1+), Ion	Walleye	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Friedmann, A.S., M.C. Watzin, T. Brinck-Johnsen, and J.C. Leiter. Low Levels of Dietary Methylmercury Inhibit Growth and Gonadal Development in Juvenile Walleye (Stizostedion vitreum). Aquat. Toxicol.35(3-4): 265-278.
Methyl mercury(1+), Ion	Walleye	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Friedmann, A.S., M.C. Watzin, T. Brinck-Johnsen, and J.C. Leiter. Low Levels of Dietary Methylmercury Inhibit Growth and Gonadal Development in Juvenile Walleye (Stizostedion vitreum). Aquat. Toxicol.35(3-4): 265-278.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	650	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	400*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	890*	NA	NR	ug/L	LAB	1986. El Sebae, A.H., M.A. El Amayem, I. Sharaf, and M. Massod. Factors Affecting Acute and Chronic Toxicity of Chlorinated Pesticides and Their Biomagnification in Alexandria Region. In: Papers Presented at the FAO/UNEP Meeting on the Toxicity and Bioaccumulation of Selected Substances in Marine Organisms, Rovinj, Yugoslavia, 5-9 Nov., 1984, FAO Fish.Rep.No.334(suppl.): 73-79.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	250*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	700*	NA	NR	ug/L	LAB	1986. El Sebae, A.H., M.A. El Amayem, I. Sharaf, and M. Massod. Factors Affecting Acute and Chronic Toxicity of Chlorinated Pesticides and Their Biomagnification in Alexandria Region. In: Papers Presented at the FAO/UNEP Meeting on the Toxicity and Bioaccumulation of Selected Substances in Marine Organisms, Rovinj, Yugoslavia, 5-9 Nov., 1984, FAO Fish.Rep.No.334(suppl.): 73-79.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	410	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1980. Joshi, A.G., and M.S. Rege. Acute Toxicity of Some Pesticides & a Few Inorganic Salts to the Mosquito Fish Gambusia affinis (Baird & Girard). Indian J. Exp. Biol.18: 435-437.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	170*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	600*	NA	NR	ug/L	LAB	1986. El Sebae, A.H., M.A. El Amayem, I. Sharaf, and M. Massod. Factors Affecting Acute and Chronic Toxicity of Chlorinated Pesticides and Their Biomagnification in Alexandria Region. In: Papers Presented at the FAO/UNEP Meeting on the Toxicity and Bioaccumulation of Selected Substances in Marine Organisms, Rovinj, Yugoslavia, 5-9 Nov., 1984, FAO Fish.Rep.No.334(suppl.): 73-79.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1989. Diamond, S.A., M.C. Newman, M. Mulvey, P.M. Dixon, and D. Martinson. Allozyme Genotype and Time to Death of Mosquitofish, Gambusia affinis (Baird and Girard), During Acute Exposure to Inorganic Mercury. Environ. Toxicol. Chem.8(7): 613-622.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1979. Boudou, A., A. Delarche, F. Ribeyre, and R. Marty. Bioaccumulation and Bioamplification of Mercury Compounds in a Second Level Consumer, Gambusia affinis-Temperature Effects. Bull. Environ. Contam. Toxicol.22(6): 813-818.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1974. Kania, H.J., and J. O'Hara. Behavioral Alterations in a Simple Predator-Prey System due to Sub-lethal Exposure to Mercury. Trans. Am. Fish. Soc.103(1): 134-136.
Mercury chloride (HgCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1974. Kania, H.J., and J. O'Hara. Behavioral Alterations in a Simple Predator-Prey System due to Sub-lethal Exposure to Mercury. Trans. Am. Fish. Soc.103(1): 134-136.
Mercury chloride (HgCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	480	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Mercury chloride (HgCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	480	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Mercury chloride (HgCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	520	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	520	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Mercury chloride (HgCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	800	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Mercury	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	420	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	220	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Mercury chloride (HgCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Mercury chloride (HgCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Mercury chloride (HgCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	830	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Mercury chloride (HgCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	740	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Mercury chloride (HgCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	687	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Mercury	Zambezi Barbel	Fish	Fresh	Mortality	NR	Not Reported	T	10	NR	NR	ug/L	LAB	2006. Wegwu, M.O., and J.O. Akaninwor. Assessment of Heavy-Metal Profile of the New Calabar River and Its Impact on Juvenile Clarias gariepinus. Chem. Biodivers.3(1): 79-87.
Mercury	Zambezi Barbel	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10	NR	NR	ug/L	LAB	2006. Wegwu, M.O., and J.O. Akaninwor. Assessment of Heavy-Metal Profile of the New Calabar River and Its Impact on Juvenile Clarias gariepinus. Chem. Biodivers.3(1): 79-87.
Mercury	Zambezi Barbel	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10	NR	NR	ug/L	LAB	2006. Wegwu, M.O., and J.O. Akaninwor. Assessment of Heavy-Metal Profile of the New Calabar River and Its Impact on Juvenile Clarias gariepinus. Chem. Biodivers.3(1): 79-87.
Mercury chloride (HgCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	LOEC	Sperm	T	25000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride (HgCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	LOEC	Sperm	T	25000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride (HgCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	25000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Mercury chloride	Zebra Danio	Fish	Fresh	Mortality	EC0	Not Reported	T	6	NR	NR	ug/L	LAB	2008. Lahnsteiner, F.. The Sensitivity and Reproducibility of the Zebrafish (Danio rerio) Embryo Test for the Screening of Waste Water Quality and for Testing the Toxicity of Chemicals. ATLA Altern. Lab. Anim.36(3): 299-311.
Mercury chloride	Zebra Danio	Fish	Fresh	Mortality	EC50	Not Reported	T	27	NR	NR	ug/L	LAB	2008. Lahnsteiner, F.. The Sensitivity and Reproducibility of the Zebrafish (Danio rerio) Embryo Test for the Screening of Waste Water Quality and for Testing the Toxicity of Chemicals. ATLA Altern. Lab. Anim.36(3): 299-311.
Mercury	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	10.43	NR	NR	uM	LAB	2006. Chan, K.M., L.L. Ku, P.C.Y. Chan, and W.K. Cheuk. Metallothionein Gene Expression in Zebrafish Embryo-Larvae and ZFL Cell-Line Exposed to Heavy Metal Ions. Mar. Environ. Res.62(suppl.1): S83 - S87.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	1982. Bresch, H.. Investigation of the Long-Term Action of Xenobiotics on Fish with Special Regard to Reproduction. Ecotoxicol. Environ. Saf.6(1): 102-112.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	16	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	4	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	2	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	2.8	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	13	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	2.8	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.

Table C-16. Summary of Results from the EcoTox Database for Fish - Mercury

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	1.4	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	2	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.13	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	10	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	2	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	1	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.15	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Mercury chloride (HgCl2)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.18	NA	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

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Table C-17. Summary of Results from the EcoTox Database for Fish - Molybdenum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Molybdenum trioxide (MoO3)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	577000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	678000	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Molybdenum trioxide (MoO3)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	370000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Molybdenum trioxide (MoO3)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	70000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Molybdenum	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Molybdenum	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	730	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Molybdenum	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1320000	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Molybdenum	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	800000	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Molybdenum	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1000000	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Molybdenum	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	500000	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Molybdenum	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-10, Jan 1-Dec 31, 1974, Colorado: 29 p..
Molybdenum	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	14100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickel	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	13100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickel	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickelous nitrate	American Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	14000	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	American Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	13200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	American Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	13000	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickel chloride (NiCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	8200	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Nickel chloride (NiCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	8700	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Nickelous nitrate	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	25000	NA	NR	ug/L	LAB	1983. Grande, M., and S. Andersen. Lethal Effects of Hexavalent Chromium, Lead and Nickel on Young Stages of Atlantic Salmon (Salmo salar L.) in Soft Water. Vatten39(4): 405-416.
Nickelous nitrate	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1983. Grande, M., and S. Andersen. Lethal Effects of Hexavalent Chromium, Lead and Nickel on Young Stages of Atlantic Salmon (Salmo salar L.) in Soft Water. Vatten39(4): 405-416.
Nickelous nitrate	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Grande, M., and S. Andersen. Lethal Effects of Hexavalent Chromium, Lead and Nickel on Young Stages of Atlantic Salmon (Salmo salar L.) in Soft Water. Vatten39(4): 405-416.
Nickelous nitrate	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Grande, M., and S. Andersen. Lethal Effects of Hexavalent Chromium, Lead and Nickel on Young Stages of Atlantic Salmon (Salmo salar L.) in Soft Water. Vatten39(4): 405-416.
Nickelous nitrate	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5003	NA	NR	ug/L	LAB	1983. Grande, M., and S. Andersen. Lethal Effects of Hexavalent Chromium, Lead and Nickel on Young Stages of Atlantic Salmon (Salmo salar L.) in Soft Water. Vatten39(4): 405-416.
Nickel	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	63100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickel	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	50000	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickel	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	46100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickelous nitrate	Banded Killifish	Fish	Fresh	Mortality	LC50*	Not Reported	T	63200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	Banded Killifish	Fish	Fresh	Mortality	LC50*	Not Reported	T	50800	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	Banded Killifish	Fish	Fresh	Mortality	LC50*	Not Reported	T	46200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	21200	NR	NR	ug/L	LAB	1981. Cairns, J.,Jr., K.W. Thompson, and A.C. Hendricks. Effects of Fluctuating, Sublethal Applications of Heavy Metal Solutions upon the Gill Ventilation Response of Bluegills (Lepomis macrochirus). EPA-600/3-81-003, U.S.EPA, Cincinnati, OH: 104 p..
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	170000	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	170000	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	110000	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	115000	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	60300	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	62200	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	495000	NA	NR	ug/L	LAB	1966. Willford, W.A.. Toxicity of 22 Therapeutic Compounds to Six Fishes. Invest.Fish Control No.18, Resourc.Publ.No.35, Fish Wildl.Serv., Bur.Sport Fish.Wildl., USDI, Washington, DC: 10 p..
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	11300	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	41700	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	15900	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	82100	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	8670	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	39600	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	5180	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	5360	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	NOEC	Not Reported	T	37000	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Bluegill	Fish	Fresh	Mortality	NOEC	Not Reported	T	42000	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Sulfuric acid, Nickel(2+)salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	242000	NA	NR	ug/L	LAB	1966. Willford, W.A.. Toxicity of 22 Therapeutic Compounds to Six Fishes. Invest.Fish Control No.18, Resourc.Publ.No.35, Fish Wildl.Serv., Bur.Sport Fish.Wildl., USDI, Washington, DC: 10 p..
Nickel	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	30000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	40000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	35000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Sulfuric acid, Nickel(2+)salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	400000	NA	NR	ug/L	LAB	1966. Willford, W.A.. Toxicity of 22 Therapeutic Compounds to Six Fishes. Invest.Fish Control No.18, Resourc.Publ.No.35, Fish Wildl.Serv., Bur.Sport Fish.Wildl., USDI, Washington, DC: 10 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	270000	NA	NR	ug/L	LAB	1966. Willford, W.A.. Toxicity of 22 Therapeutic Compounds to Six Fishes. Invest.Fish Control No.18, Resourc.Publ.No.35, Fish Wildl.Serv., Bur.Sport Fish.Wildl., USDI, Washington, DC: 10 p..
Nickel chloride (NiCl2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Effects of Six Trace Metals on Calcium Fluxes in Brown Trout (Salmo trutta L.) in Soft Water. J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.: 537-542.
Nickel chloride (NiCl2)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	212	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Embryonic and Larval Development of Brown Trout, Salmo trutta L.: Exposure to Trace Metal Mixtures in Soft Water. J. Fish Biol.38: 773-787.
Nickel chloride (NiCl2)	Brown Trout	Fish	Fresh	Reproduction	LOEC	Sperm	T	125000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nickel chloride (NiCl2)	Brown Trout	Fish	Fresh	Reproduction	NOEC	Sperm	T	125000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nickel chloride (NiCl2)	Brown Trout	Fish	Fresh	Reproduction	NOEC	Sperm	T	125000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Burbot	Fish	Fresh	Reproduction	NOEC	Sperm	T	150000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nickel chloride (NiCl2)	Burbot	Fish	Fresh	Reproduction	NOEC	Sperm	T	150000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nickel chloride (NiCl2)	Burbot	Fish	Fresh	Reproduction	NOEC	Sperm	T	150000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid, Nickel(2+)salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	98520	NR	NR	ug/L	LAB	1982. Kapur, K., and N.A. Yadav. The Effects of Certain Heavy Metal Salts on the Development of Eggs in Common Carp, Cyprinus carpio var. communis. Acta Hydrochim. Hydrobiol.10(5): 517-522.
Sulfuric acid, Nickel(2+)salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	368000	NA	NR	ug/L	LAB	1966. Willford, W.A.. Toxicity of 22 Therapeutic Compounds to Six Fishes. Invest.Fish Control No.18, Resourc.Publ.No.35, Fish Wildl.Serv., Bur.Sport Fish.Wildl., USDI, Washington, DC: 10 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	165000	NA	NR	ug/L	LAB	1966. Willford, W.A.. Toxicity of 22 Therapeutic Compounds to Six Fishes. Invest.Fish Control No.18, Resourc.Publ.No.35, Fish Wildl.Serv., Bur.Sport Fish.Wildl., USDI, Washington, DC: 10 p..
Nickel chloride (NiCl2)	Chub	Fish	Fresh	Reproduction	LOEC	Sperm	T	12000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nickel chloride (NiCl2)	Chub	Fish	Fresh	Reproduction	NOEC	Sperm	T	12000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nickel chloride (NiCl2)	Chub	Fish	Fresh	Reproduction	NOEC	Sperm	T	12000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC0	Not Reported	T	5000	NA	NR	ug/L	LAB	1978. Lorz, H.W., R.H. Williams, and C.A. Fustish. Effects of Several Metals on Smolting of Coho Salmon. EPA-600/3-78-090, U.S.EPA, Corvallis, OR: 84 p..
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	48400		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	48800		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	52600		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	55600		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	59100		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	63600		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	83200		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	83400		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	16700	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	18000	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Sulfuric acid, Nickel(2+)salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	16000	NA	NR	ug/L	LAB	1980. Becker, C.D., and M.G. Wolford. Thermal Resistance of Juvenile Salmonids Sublethally Exposed to Nickel, Determined by the Critical Thermal Maximum Method. Environ. Pollut.21(3): 181-189.
Sulfuric acid, Nickel(2+)salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	4500	NA	NR	ug/L	LAB	1980. Becker, C.D., and M.G. Wolford. Thermal Resistance of Juvenile Salmonids Sublethally Exposed to Nickel, Determined by the Critical Thermal Maximum Method. Environ. Pollut.21(3): 181-189.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Growth	NR		T	3000	NA	NR	ug/L	LAB	1979. Blaylock, B.G., and M.L. Frank. A Comparison of the Toxicity of Nickel to the Developing Eggs and Larvae of Carp (Cyprinus carpio). Bull. Environ. Contam. Toxicol.21(4-5): 604-611.
Nickel	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	38300	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickel	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	28900	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickel	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nickel	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1540	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nickel	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1640	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nickel	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2300	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nickel	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	10400	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	22000*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	95300	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	17000*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	50000	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	16000*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	14790	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	43650	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	48000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	6900	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	A	7940	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	40800	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1540	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1640	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	133950	NA	NR	ug/L	LAB	1992. Thatheyus, A.J.. Behavioral Alterations Induced by Nickel and Chromium in Common Carp Cyprinus carpio Var communis (Linn). Environ. Ecol.10(4): 911-913.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1979. Blaylock, B.G., and M.L. Frank. A Comparison of the Toxicity of Nickel to the Developing Eggs and Larvae of Carp (Cyprinus carpio). Bull. Environ. Contam. Toxicol.21(4-5): 604-611.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	75210	NA	NR	ug/L	LAB	1992. Thatheyus, A.J.. Behavioral Alterations Induced by Nickel and Chromium in Common Carp Cyprinus carpio Var communis (Linn). Environ. Ecol.10(4): 911-913.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NR	NR	ug/L	LAB	1997. Gopal, V., S. Parvathy, and P.R. Balasubramanian. Effect of Heavy Metals on the Blood Protein Biochemistry of the Fish Cyprinus carpio and Its Use as a Bio-Indicator of Pollution Stress. Environ. Monit. Assess.48: 117-124.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	6100	NA	NR	ug/L	LAB	1979. Blaylock, B.G., and M.L. Frank. A Comparison of the Toxicity of Nickel to the Developing Eggs and Larvae of Carp (Cyprinus carpio). Bull. Environ. Contam. Toxicol.21(4-5): 604-611.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	8460	NA	NR	ug/L	LAB	1979. Blaylock, B.G., and M.L. Frank. A Comparison of the Toxicity of Nickel to the Developing Eggs and Larvae of Carp (Cyprinus carpio). Bull. Environ. Contam. Toxicol.21(4-5): 604-611.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	60750	NA	NR	ug/L	LAB	1992. Thatheyus, A.J.. Behavioral Alterations Induced by Nickel and Chromium in Common Carp Cyprinus carpio Var communis (Linn). Environ. Ecol.10(4): 911-913.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	6160	NA	NR	ug/L	LAB	1979. Blaylock, B.G., and M.L. Frank. A Comparison of the Toxicity of Nickel to the Developing Eggs and Larvae of Carp (Cyprinus carpio). Bull. Environ. Contam. Toxicol.21(4-5): 604-611.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	47580	NA	NR	ug/L	LAB	1992. Thatheyus, A.J.. Behavioral Alterations Induced by Nickel and Chromium in Common Carp Cyprinus carpio Var communis (Linn). Environ. Ecol.10(4): 911-913.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3180	NA	NR	ug/L	LAB	1979. Blaylock, B.G., and M.L. Frank. A Comparison of the Toxicity of Nickel to the Developing Eggs and Larvae of Carp (Cyprinus carpio). Bull. Environ. Contam. Toxicol.21(4-5): 604-611.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2140	NA	NR	ug/L	LAB	1979. Blaylock, B.G., and M.L. Frank. A Comparison of the Toxicity of Nickel to the Developing Eggs and Larvae of Carp (Cyprinus carpio). Bull. Environ. Contam. Toxicol.21(4-5): 604-611.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1300	NA	NR	ug/L	LAB	1979. Blaylock, B.G., and M.L. Frank. A Comparison of the Toxicity of Nickel to the Developing Eggs and Larvae of Carp (Cyprinus carpio). Bull. Environ. Contam. Toxicol.21(4-5): 604-611.
Nickelous nitrate	Common Carp	Fish	Fresh	Mortality	LC50*	Not Reported	T	38200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	Common Carp	Fish	Fresh	Mortality	LC50*	Not Reported	T	29100	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	Common Carp	Fish	Fresh	Mortality	LC50*	Not Reported	T	10600	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	20000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	30000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	20000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	30000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	20000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	30000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	20000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	30000	NA	NR	ug/L	LAB	1983. Muramoto, S.. Influence of Complexans (NTA,EDTA) on the Toxicity of Nickel Chloride and Sulfate to Fish at high Concentrations. J. Environ. Sci. Health A18(6): 787-795.
Nickel	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nickel	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3500	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	20000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	40000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	40000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	75000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	75000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nickel	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	500	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nickel	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	500	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	100	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	1000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	30000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	30000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	5000	NR	NR	ug/L	LAB	1995. Virk, S., and R.C. Sharma. Effect of Nickel and Chromium on Various Life Stages of Cyprinus carpio Linn. Indian J. Ecol.22(2): 77-81.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	16000	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Whole Organism	T	433.5	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3100	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3400	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	18000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	50000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12356	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	17678	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2916	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2923	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5163	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5209	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5383	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8617	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	10400	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	104000	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	13500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	79100	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	7910	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	51600	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	5930	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	59300	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	25000	NA	NR	ug/L	LAB	1974. Pickering, Q.H.. Chronic Toxicity of Nickel to the Fathead Minnow. J. Water Pollut. Control Fed.46(4): 760-765.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	28000	NA	NR	ug/L	LAB	1974. Pickering, Q.H.. Chronic Toxicity of Nickel to the Fathead Minnow. J. Water Pollut. Control Fed.46(4): 760-765.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	32200	NA	NR	ug/L	LAB	1974. Pickering, Q.H.. Chronic Toxicity of Nickel to the Fathead Minnow. J. Water Pollut. Control Fed.46(4): 760-765.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	24000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	27000	NA	NR	ug/L	LAB	1974. Pickering, Q.H.. Chronic Toxicity of Nickel to the Fathead Minnow. J. Water Pollut. Control Fed.46(4): 760-765.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	32000	NA	NR	ug/L	LAB	1974. Pickering, Q.H.. Chronic Toxicity of Nickel to the Fathead Minnow. J. Water Pollut. Control Fed.46(4): 760-765.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	4000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	42400	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	44500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	4580	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	5180	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	380	NA	NR	ug/L	LAB	1974. Pickering, Q.H.. Chronic Toxicity of Nickel to the Fathead Minnow. J. Water Pollut. Control Fed.46(4): 760-765.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	730	NA	NR	ug/L	LAB	1974. Pickering, Q.H.. Chronic Toxicity of Nickel to the Fathead Minnow. J. Water Pollut. Control Fed.46(4): 760-765.
Nickel chloride (NiCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	16000	NA	NR	ug/L	LAB	1992. Kszos, L.A., A.J. Stewart, and P.A. Taylor. An Evaluation of Nickel Toxicity to Ceriodaphnia dubia and Daphnia magna in a Contaminated Stream and in Laboratory Tests. Environ. Toxicol. Chem.11(7): 1001-1012.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	433.5	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	108.9	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	433.5	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	108.9	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1532.1	NR	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Sulfuric acid, Nickel(2+)salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	96120	NA	NR	ug/L	LAB	1987. Kumar, N., and K. Nath. Toxicity of Nickel to a Fresh Water Teleost, Colisa fasciatus. Acta Hydrochim. Hydrobiol.15(3): 313-315.
Sulfuric acid, Nickel(2+)salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	60180	NA	NR	ug/L	LAB	1987. Kumar, N., and K. Nath. Toxicity of Nickel to a Fresh Water Teleost, Colisa fasciatus. Acta Hydrochim. Hydrobiol.15(3): 313-315.
Sulfuric acid, Nickel(2+)salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	24450	NA	NR	ug/L	LAB	1987. Kumar, N., and K. Nath. Toxicity of Nickel to a Fresh Water Teleost, Colisa fasciatus. Acta Hydrochim. Hydrobiol.15(3): 313-315.
Sulfuric acid, Nickel(2+)salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	16720	NA	NR	ug/L	LAB	1987. Kumar, N., and K. Nath. Toxicity of Nickel to a Fresh Water Teleost, Colisa fasciatus. Acta Hydrochim. Hydrobiol.15(3): 313-315.
Sulfuric acid, Nickel(2+)salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	23000*	NA	NR	ug/L	LAB	1979. Agrawal, S.J., A.K. Srivastava, and H.S. Chaudhry. Haematological Effects of Nickel Toxicity on a Fresh Water Teleost, Colisa fasciatus. Acta Pharm. Toxicol.45(3): 215-217.
Sulfuric acid, Nickel(2+)salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	NR	Not Reported	T	17000*	NA	NR	ug/L	LAB	1979. Agrawal, S.J., A.K. Srivastava, and H.S. Chaudhry. Haematological Effects of Nickel Toxicity on a Fresh Water Teleost, Colisa fasciatus. Acta Pharm. Toxicol.45(3): 215-217.
Nickel chloride (NiCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	129000	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Nickel chloride (NiCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	100500	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Nickel chloride (NiCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Ellgaard, E.G., S.E. Ashley, A.E. Langford, and D.C. Harlin. Kinetic Analysis of the Swimming Behavior of the Goldfish, Carassius auratus, Exposed to Nickel: Hypoactivity Induced by Sublethal Concentrations. Bull. Environ. Contam. Toxicol.55(6): 929-936.
Nickel chloride (NiCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	63000	NA	NR	ug/L	LAB	1980. Ding, S.R.. Acute Toxicities of Vanadium, Nickel and Cobalt to Several Species of Aquatic Organisms. Environ. Qual.1: 17-21.
Nickel chloride (NiCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2140	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Nickel chloride (NiCl2)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	34100	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	20500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	9820	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Nickel chloride (NiCl2)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	1000000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Nickel chloride (NiCl2)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	1000000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Nickel chloride (NiCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	95000	NA	NR	ug/L	LAB	1990. Khangarot, B.S., and P.K. Ray. Acute Toxicity and Toxic Interaction of Chromium and Nickel to Common Guppy Poecilia reticulata (Peters). Bull. Environ. Contam. Toxicol.44(6): 832-839.
Nickel chloride (NiCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	31150	NA	NR	ug/L	LAB	1990. Khangarot, B.S., and P.K. Ray. Acute Toxicity and Toxic Interaction of Chromium and Nickel to Common Guppy Poecilia reticulata (Peters). Bull. Environ. Contam. Toxicol.44(6): 832-839.
Nickel chloride (NiCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1981. Khangarot, B.S., V.S. Durve, and V.K. Rajbanshi. Toxicity of Interactions of Zinc-Nickel, Copper-Nickel and Zinc-Nickel-Copper to a Freshwater Teleost, Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 495-503.
Nickel chloride (NiCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	63000	NA	NR	ug/L	LAB	1990. Khangarot, B.S., and P.K. Ray. Acute Toxicity and Toxic Interaction of Chromium and Nickel to Common Guppy Poecilia reticulata (Peters). Bull. Environ. Contam. Toxicol.44(6): 832-839.
Nickel chloride (NiCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	50120	NA	NR	ug/L	LAB	1990. Khangarot, B.S., and P.K. Ray. Acute Toxicity and Toxic Interaction of Chromium and Nickel to Common Guppy Poecilia reticulata (Peters). Bull. Environ. Contam. Toxicol.44(6): 832-839.
Nickel chloride (NiCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	9650*	NA	NR	ug/L	LAB	1975. Anderson, P.D., and L.J. Weber. Toxic Response as a Quantitative Function of Body Size. Toxicol. Appl. Pharmacol.33(3): 471-483.
Nickel chloride (NiCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	36000	NA	NR	ug/L	LAB	1990. Khangarot, B.S., and P.K. Ray. Acute Toxicity and Toxic Interaction of Chromium and Nickel to Common Guppy Poecilia reticulata (Peters). Bull. Environ. Contam. Toxicol.44(6): 832-839.

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	33110	NA	NR	ug/L	LAB	1990. Khangarot, B.S., and P.K. Ray. Acute Toxicity and Toxic Interaction of Chromium and Nickel to Common Guppy Poecilia reticulata (Peters). Bull. Environ. Contam. Toxicol.44(6): 832-839.
Sulfuric acid, Nickel(2+)salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	336300		NC	ug/L	LAB	2001. Khunyakari, R.P., V. Tare, and R.N. Sharma. Effects of Some Trace Heavy Metals on Poecilia reticulata (Peters).. J. Environ. Biol.22(2): 141-144.
Sulfuric acid, Nickel(2+)salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	204200		NC	ug/L	LAB	2001. Khunyakari, R.P., V. Tare, and R.N. Sharma. Effects of Some Trace Heavy Metals on Poecilia reticulata (Peters).. J. Environ. Biol.22(2): 141-144.
Sulfuric acid, Nickel(2+)salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	73000	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	56000	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	48480	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	40960	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	34900	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Nickel chloride (NiCl2)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	18300	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	9560	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel chloride (NiCl2)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	4450	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Nickel	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.0475	NR	NR	ug/L	LAB	2000. Nanda, P., B.N. Panda, and M.K. Behera. Nickel Induced Alterations in Protein Level of Some Tissues of Heteropneustes fossilis. J. Environ. Biol.21(2): 117-119.
Sulfuric acid, Nickel(2+)salt (1:1)	ke Trout, Siscov	Fish	Fresh	Mortality	LC50	Not Reported	T	170000	NA	NR	ug/L	LAB	1966. Willford, W.A.. Toxicity of 22 Therapeutic Compounds to Six Fishes. Invest.Fish Control No.18, Resourc.Publ.No.35, Fish Wildl.Serv., Bur.Sport Fish.Wildl., USDI, Washington, DC: 10 p..
Sulfuric acid, Nickel(2+)salt (1:1)	ke Trout, Siscov	Fish	Fresh	Mortality	LC50	Not Reported	T	75000	NA	NR	ug/L	LAB	1966. Willford, W.A.. Toxicity of 22 Therapeutic Compounds to Six Fishes. Invest.Fish Control No.18, Resourc.Publ.No.35, Fish Wildl.Serv., Bur.Sport Fish.Wildl., USDI, Washington, DC: 10 p..
Nickel chloride (NiCl2)	Largemouth Bas	Fish	Fresh	Mortality	LC50	Not Reported	T	2020	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Nickel chloride (NiCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Hiraoka, Y., S. Ishizawa, T. Kamada, and H. Okuda. Acute Toxicity of 14 Different Kinds of Metals Affecting Medaka Fry. Hiroshima J. Med. Sci.34(3): 327-330.
Nickel	Minnow,Carp Family	Fish	Fresh	Mortality	NR	Not Reported	T	45000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	innow,Carp Fam	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	200000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	innow,Carp Fam	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	125000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	75000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	65000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Minnow,Carp Family	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	100000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	150000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Nickel	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	150000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Nickel	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	185000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Nickel	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	230000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Nickel	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	270000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Nickel	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	310000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Nickel	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	350000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Nickel	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	68000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Nickel chloride (NiCl2)	Mummichog	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	7300*	NA	NR	ug/L	LAB	1915. Thomas, A.. Effects of Certain Metallic Salts upon Fishes. Trans. Am. Fish. Soc.44: 120-124.
Nickel chloride (NiCl2)	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	27200	NR	NR	ug/L	LAB	1995. Alkahem, H.F.. Effects of Nickel on Carbohydrate Metabolism of Oreochromis niloticus. Dirasat Ser. B Pure Appl. Sci.22(1): 83-88.
Nickel chloride (NiCl2)	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	27200	NA	NR	ug/L	LAB	1994. Alkahem, H.F.. The Toxicity of Nickel and the Effects of Sublethal Levels on Haematological Parameters and Behaviour of the Fish, Oreochromis niloticus. J. Univ. Kuwait Sci.21(2): 243-251.
Nickel	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	16400	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickel	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	12100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickel	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickelous nitrate	Pumpkinseed	Fish	Fresh	Mortality	LC50*	Not Reported	T	16400	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	Pumpkinseed	Fish	Fresh	Mortality	LC50*	Not Reported	T	12000	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	Pumpkinseed	Fish	Fresh	Mortality	LC50*	Not Reported	T	8100	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Gill(s)	D	10700	NR	NR	ug/L	LAB	2004. Pane, E.F., A. Haque, and C.M. Wood. Mechanistic Analysis of Acute, Ni-Induced Respiratory Toxicity in the Rainbow Trout (Oncorhynchus mykiss): An Exclusively Branchial Phenomenon. Aquat. Toxicol.69(1): 11-24.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Gill(s)	D	10700	NR	NR	ug/L	LAB	2004. Pane, E.F., A. Haque, and C.M. Wood. Mechanistic Analysis of Acute, Ni-Induced Respiratory Toxicity in the Rainbow Trout (Oncorhynchus mykiss): An Exclusively Branchial Phenomenon. Aquat. Toxicol.69(1): 11-24.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Gill(s)	D	10700	NR	NR	ug/L	LAB	2004. Pane, E.F., A. Haque, and C.M. Wood. Mechanistic Analysis of Acute, Ni-Induced Respiratory Toxicity in the Rainbow Trout (Oncorhynchus mykiss): An Exclusively Branchial Phenomenon. Aquat. Toxicol.69(1): 11-24.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	134	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	700	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	134	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	431	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	700	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	238	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	35	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	431	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	62	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	35	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15000		NC	ug/L	LAB	2003. Sloman, K.A., D.W. Baker, C.G. Ho, D.G. McDonald, and C.M. Wood. The Effects of Trace Metal Exposure on Agonistic Encounters in Juvenile Rainbow Trout, Oncorhynchus mykiss. Aquat. Toxicol.63(2): 187-196.
Nickel	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Nickel	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1981. Birge, W.J., J.A. Black, and B.A. Ramey. The Reproductive Toxicology of Aquatic Contaminants. In: J.Saxena and F.Fisher (Eds.), Hazard Assessment of Chemicals: Current Developments, Academic Press, New York, NY1: 59-115.
Nickel	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	90	NR	NR	ug/L	LAB	1981. Birge, W.J., J.A. Black, and B.A. Ramey. The Reproductive Toxicology of Aquatic Contaminants. In: J.Saxena and F.Fisher (Eds.), Hazard Assessment of Chemicals: Current Developments, Academic Press, New York, NY1: 59-115.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1400	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10900	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8100	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8900	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15000	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	25100	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7790	NA	NR	ug/L	LAB	1991. Buhl, K.J., and S.J. Hamilton. Relative Sensitivity of Early Life Stages of Arctic Grayling, Coho Salmon, and Rainbow Trout to Nine Inorganics. Ecotoxicol. Environ. Saf.22: 184-197.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	196000	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	312000	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	51000	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	94300	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13700	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	16300	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	320000	NA	NR	ug/L	LAB	1966. Willford, W.A.. Toxicity of 22 Therapeutic Compounds to Six Fishes. Invest.Fish Control No.18, Resourc.Publ.No.35, Fish Wildl.Serv., Bur.Sport Fish.Wildl., USDI, Washington, DC: 10 p..

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1900	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4900	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1710	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	47100	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7140*	NA	NR	ug/L	LAB	1970. Brown, V.M., and R.A. Dalton. The Acute Lethal Toxicity to Rainbow Trout of Mixtures of Copper, Phenol, Zinc and Nickel. J. Fish Biol.2(3): 211-216.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	263000	NA	NR	ug/L	LAB	1983. Bornatowicz, N.. Assessment of the Acute Toxicity of Nickel Sulfate to Rainbow Trout (Bestimmung der Akuten Toxizitact von NiSO4 an Regenbogenforellen). Oesterreichisches Forschungszentrum Seibersdorf, G.m.b.H.Inst.fuer Biologie, Germany: 22 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	160000	NA	NR	ug/L	LAB	1966. Willford, W.A.. Toxicity of 22 Therapeutic Compounds to Six Fishes. Invest.Fish Control No.18, Resourc.Publ.No.35, Fish Wildl.Serv., Bur.Sport Fish.Wildl., USDI, Washington, DC: 10 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11100	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11300	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15900	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15900	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	16600	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	16900	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11100	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11300	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	12700	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20100	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	28000	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	30900	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1280	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	19200	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7100	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5600	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4500	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5700	NR	NR	ug/L	LAB	1981. Anderson, D.R.. The Combined Effects of Nickel, Chlorine and Temperature on the Mortality of Rainbow Trout, Salmo gairdneri. Ph.D.Thesis, University of Washington, Seattle, WA: 202 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	130000	NA	NR	ug/L	LAB	1984. Butz, I.. Influence of Diluent Water on the Acute Toxicity of Nickel Sulphate at Rainbow Trout. Aquat. Sci. Fish. Abstr. 15(7):237 (1985) / Wasser Abwasser28: 41-56.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	142000	NA	NR	ug/L	LAB	1984. Butz, I.. Influence of Diluent Water on the Acute Toxicity of Nickel Sulphate at Rainbow Trout. Aquat. Sci. Fish. Abstr. 15(7):237 (1985) / Wasser Abwasser28: 41-56.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	172000	NA	NR	ug/L	LAB	1984. Butz, I.. Influence of Diluent Water on the Acute Toxicity of Nickel Sulphate at Rainbow Trout. Aquat. Sci. Fish. Abstr. 15(7):237 (1985) / Wasser Abwasser28: 41-56.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	63000	NA	NR	ug/L	LAB	1984. Butz, I.. Influence of Diluent Water on the Acute Toxicity of Nickel Sulphate at Rainbow Trout. Aquat. Sci. Fish. Abstr. 15(7):237 (1985) / Wasser Abwasser28: 41-56.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	66000	NA	NR	ug/L	LAB	1984. Butz, I.. Influence of Diluent Water on the Acute Toxicity of Nickel Sulphate at Rainbow Trout. Aquat. Sci. Fish. Abstr. 15(7):237 (1985) / Wasser Abwasser28: 41-56.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	73000	NA	NR	ug/L	LAB	1984. Butz, I.. Influence of Diluent Water on the Acute Toxicity of Nickel Sulphate at Rainbow Trout. Aquat. Sci. Fish. Abstr. 15(7):237 (1985) / Wasser Abwasser28: 41-56.
Nickelous nitrate	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	35500	NR	NR	ug/L	LAB	1977. Hale, J.G.. Toxicity of Metal Mining Wastes. Bull. Environ. Contam. Toxicol.17(1): 66-73.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	4900	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	5600	NA	NR	ug/L	LAB	1975. Bentley, R.E., T. Heitmuller, B.H.,III Sleight, and P.R. Parrish. Acute Toxicity of Nickel to Bluegill (Lepomis macrochirus), Rainbow Trout (Salmo gairdneri), and Pink Shrimp (Penaeus duorarum). U.S.EPA, Criteria Branch, WA-6-99-1414-B, Washington, D.C: 14.
Nickel	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	25000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1100	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1680	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	134	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	62	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	134	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	62	NA	NR	ug/L	LAB	1985. Nebeker, A.V., C. Savonen, and D.G. Stevens. Sensitivity of Rainbow Trout Early Life Stages to Nickel Chloride. Environ. Toxicol. Chem.4(2): 233-239.
Sulfuric acid, Nickel(2+)salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1980. Becker, C.D., and M.G. Wolford. Thermal Resistance of Juvenile Salmonids Sublethally Exposed to Nickel, Determined by the Critical Thermal Maximum Method. Environ. Pollut.21(3): 181-189.
Nickel	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	40000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	35000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	30000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel chloride (NiCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100000	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Sulfuric acid, Nickel(2+)salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	150000	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	77830	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	50420	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	58420	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	48830	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Roach	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1984. Van Hoof, F., and J.P. Nauwelaers. Distribution of Nickel in the Roach (Rutilus rutilus L.) After Exposure to Lethal and Sublethal Concentrations. Chemosphere13(9): 1053-1058.
Sulfuric acid, Nickel(2+)salt (1:1)	Rock Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	2480	NA	NR	ug/L	LAB	1978. Lind, D., K. Alto, and S. Chatterton. Regional Copper-Nickel Study. Draft Report, Minnesota Environmental Quality Board St.Paul, MN: 54.
Nickel chloride (NiCl2)	Rohu	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	4000		NC	ug/L	LAB	2004. Bhatkar, N.V.. Effects of Chlorides of Chromium, Nickel and Zinc on Melanophores of the Scales of Freshwater Carp Labeo rohita. J. Ecotoxicol. Environ. Monit.14(4): 267-272.
Nickel chloride (NiCl2)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	144900*	NA	NR	ug/L	LAB	1981. Gill, T.S., and J.C. Pant. Toxicity of Nickel to the Fish Puntius conchonius (Ham.) and its Effects on Blood Glucose and Liver Glycogen. Comp. Physiol. Ecol.6(2): 99-102.
Nickel chloride (NiCl2)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	72990*	NA	NR	ug/L	LAB	1981. Gill, T.S., and J.C. Pant. Toxicity of Nickel to the Fish Puntius conchonius (Ham.) and its Effects on Blood Glucose and Liver Glycogen. Comp. Physiol. Ecol.6(2): 99-102.
Sulfuric acid, Nickel(2+)salt (1:1)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	33120*	NA	NR	ug/L	LAB	1981. Gill, T.S., and J.C. Pant. Toxicity of Nickel to the Fish Puntius conchonius (Ham.) and its Effects on Blood Glucose and Liver Glycogen. Comp. Physiol. Ecol.6(2): 99-102.
Sulfuric acid, Nickel(2+)salt (1:1)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	83200*	NA	NR	ug/L	LAB	1981. Gill, T.S., and J.C. Pant. Toxicity of Nickel to the Fish Puntius conchonius (Ham.) and its Effects on Blood Glucose and Liver Glycogen. Comp. Physiol. Ecol.6(2): 99-102.
Nickel	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.009	NA	NR	%	LAB	1995. Sornaraj, R., P. Baskaran, and S. Thanalakshmi. Effects of Heavy Metals on Some Physiological Responses of Air-Breathing Fish Channa punctatus (Bloch). Environ. Ecol.13(1): 202-207.
Nickel	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.007	NA	NR	%	LAB	1995. Sornaraj, R., P. Baskaran, and S. Thanalakshmi. Effects of Heavy Metals on Some Physiological Responses of Air-Breathing Fish Channa punctatus (Bloch). Environ. Ecol.13(1): 202-207.
Nickel chloride (NiCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	230900*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Nickel chloride (NiCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	206700*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Nickel chloride (NiCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	197900*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Nickel chloride (NiCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	139100*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Sulfuric acid, Nickel(2+)salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	100000	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	68740	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	35290	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	37000	NA	NR	ug/L	LAB	1982. Khangarot, B.S., and V.S. Durve. Note on the Acute Toxicity of Zinc, and the Interactions of Zinc and Nickel to a Freshwater Teleost Channa punctatus (Bloch). Indian J. Anim. Sci.52(8): 722-725.
Sulfuric acid, Nickel(2+)salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	25520	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	24500	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Nickel	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickel	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	8500	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickel chloride (NiCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Nickel chloride (NiCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	33000	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Nickel chloride (NiCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	3900	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Nickelous nitrate	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	10000	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	8400	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	6200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickel	Striped Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	255000	NA	NR	ug/L	LAB	1982. Verma, S.R., M. Jain, and R.C. Dalela. A Laboratory Study to Assess Separate and In-Combination Effects of Zinc, Chromium and Nickel to the Fish Mystus vittatus. Acta Hydrochim. Hydrobiol.10(1): 23-29.
Nickel	Tench	Fish	Fresh	Mortality	NR	Not Reported	T	55000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	75000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	65000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickel	Tench	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NA	NR	ug/L	LAB	1957. Schweiger, G.. The Toxic Action of Heavy Metals Salts on Fish and Organisms on Which Fish Feed. Arch. Fischereiwiss.8: 54-78.
Nickelous nitrate	Threespine Stickleback	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	800	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Sulfuric acid, Nickel(2+)salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	70500	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	23790	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	15880	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	13570	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Nickel(2+)salt (1:1)	Walking Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	71500	NA	NR	ug/L	LAB	1998. Ray, D., and S.K. Banerjee. Hematological and Histopathological Changes in Clarias batrachus (Linn) Exposed to Nickel and Vanadium. Environ. Ecol.16(1): 151-156.
Nickel chloride (NiCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	50000	NA	NR	ug/L	LAB	1991. Linder et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nickel chloride (NiCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	70000	NA	NR	ug/L	LAB	1991. Hopfer et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nickel chloride (NiCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	75000	NA	NR	ug/L	LAB	1987. Khangarot and Ray. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nickel chloride (NiCl2)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	90000	NA	NR	ug/L	LAB	1978. Birge. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

Table C-18. Summary of Results from the EcoTox Database for Fish - Nickel

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	18400	NA	NR	ug/L	LAB	1980. Birge and Black. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nickel	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1978. Birge et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Nickel	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	13700	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Nickelous nitrate	White Perch	Fish	Fresh	Mortality	LC50*	Not Reported	T	18400	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	White Perch	Fish	Fresh	Mortality	LC50*	Not Reported	T	16200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickelous nitrate	White Perch	Fish	Fresh	Mortality	LC50*	Not Reported	T	13600	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Nickel chloride (NiCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	125000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nickel chloride (NiCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	125000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nickel chloride (NiCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	125000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Nickel chloride	Zebra Danio	Fish	Fresh	Mortality	EC0	Not Reported	T	35000	NR	NR	ug/L	LAB	2008. Lahnsteiner, F.. The Sensitivity and Reproducibility of the Zebrafish (Danio rerio) Embryo Test for the Screening of Waste Water Quality and for Testing the Toxicity of Chemicals. ATLA Altern. Lab. Anim.36(3): 299-311.
Nickel chloride	Zebra Danio	Fish	Fresh	Mortality	EC50	Not Reported	T	640000	NR	NR	ug/L	LAB	2008. Lahnsteiner, F.. The Sensitivity and Reproducibility of the Zebrafish (Danio rerio) Embryo Test for the Screening of Waste Water Quality and for Testing the Toxicity of Chemicals. ATLA Altern. Lab. Anim.36(3): 299-311.
Sulfuric acid, Nickel(2+)salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	45	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Sulfuric acid, Nickel(2+)salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	360	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Sulfuric acid, Nickel(2+)salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	40	NA	NR	ug/L	LAB	1991. Dave, G., and R. Xiu. Toxicity of Mercury, Copper, Nickel, Lead, and Cobalt to Embryos and Larvae of Zebrafish, Brachydanio rerio. Arch. Environ. Contam. Toxicol.21: 126-134.
Sulfuric acid, Nickel(2+)salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	80	NA	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1254	Arctic Char	Fish	Fresh	Growth	LOEC	Whole Organism	A	100000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	A	100000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	A	100000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	A	100000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	A	100000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	F	100000	NR	NR	ug/L	LAB	2006. Vijayan, M.M., N. Aluru, A.G. Maule, and E.H. Jorgensen. Fasting Augments PCB Impact on Liver Metabolism in Anadromous Arctic Char. Toxicol. Sci.91(2): 431-439.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	F	100000	NR	NR	ug/L	LAB	2006. Vijayan, M.M., N. Aluru, A.G. Maule, and E.H. Jorgensen. Fasting Augments PCB Impact on Liver Metabolism in Anadromous Arctic Char. Toxicol. Sci.91(2): 431-439.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	A	100000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	A	1000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	A	100000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	A	100000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	A	100000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NOEC	Whole Organism	A	100000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
1,1'-Biphenyl, Chloro derivs.	Arctic Char	Fish	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug/L	LAB	2002. Jorgensen, E.H., H. Foshaug, P. Andersson, I.C. Burkow, and M. Jobling. Polychlorinated Biphenyl Toxicokinetics and P4501A Responses in Anadromous Arctic Charr During Winter Emaciation. Environ. Toxicol. Chem.21(8): 1745-1752.
PCB 1260	Arctic Char	Fish	Fresh	Growth	NR	Whole Organism	F	1000	NR	NR	ug/L	LAB	1999. Jorgensen, E.H., B.E. Bye, and M. Jobling. Influence of Nutritional Status on Biomarker Responses to PCB in the Arctic Charr (Salvelinus alpinus). Aquat. Toxicol.44(4): 233-244.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NR	Whole Organism	A	NR	NR	NR	ug/L	LAB	2002. Jorgensen, E.H., M.M. Vijayan, N. Aluru, and A.G. Maule. Fasting Modifies Aroclor 1254 Impact on Plasma Cortisol, Glucose and Lactate Responses to a Handling Disturbance in Arctic Charr. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.132(2): 235-245.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NR	Whole Organism	A	100000	NR	NR	ug/L	LAB	2002. Jorgensen, E.H., M.M. Vijayan, N. Aluru, and A.G. Maule. Fasting Modifies Aroclor 1254 Impact on Plasma Cortisol, Glucose and Lactate Responses to a Handling Disturbance in Arctic Charr. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.132(2): 235-245.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NR	Whole Organism	A	NR	NR	NR	ug/L	LAB	2002. Jorgensen, E.H., M.M. Vijayan, N. Aluru, and A.G. Maule. Fasting Modifies Aroclor 1254 Impact on Plasma Cortisol, Glucose and Lactate Responses to a Handling Disturbance in Arctic Charr. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.132(2): 235-245.
PCB 1254	Arctic Char	Fish	Fresh	Growth	NR	Whole Organism	A	100000	NR	NR	ug/L	LAB	2002. Jorgensen, E.H., M.M. Vijayan, N. Aluru, and A.G. Maule. Fasting Modifies Aroclor 1254 Impact on Plasma Cortisol, Glucose and Lactate Responses to a Handling Disturbance in Arctic Charr. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.132(2): 235-245.
PCB 1254	Arctic Char	Fish	Fresh	Mortality	LOEC	Not Reported	A	100000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
PCB 1254	Arctic Char	Fish	Fresh	Mortality	NOEC	Not Reported	A	1000	NR	NR	ug/L	LAB	2004. Jorgensen, E.H., O. Aas-Hansen, A.G. Maule, J.E.T. Strand, and M.M. Vijayan. PCB Impairs Smoltification and Seawater Performance in Anadromous Arctic Charr (Salvelinus alpinus). Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.138(2): 203-212.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Arctic Grayling	Fish	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug/L	LAB	2001. Palace, V.P., S.M. Allen-Gil, S.B. Brown, R.E. Evans, D.A. Metner, D.H. Landers, L.R. Curtis, J.F. Klaverkamp, C.L. Baro. Vitamin and Thyroid Status in Arctic Grayling (Thymallus arcticus) Exposed to Doses of 3,3',4,4'-Tetrachlorobiphenyl that Induce the Phase I Enzyme System. Chemosphere45(2): 185-193.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Arctic Grayling	Fish	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug/L	LAB	2001. Palace, V.P., S.M. Allen-Gil, S.B. Brown, R.E. Evans, D.A. Metner, D.H. Landers, L.R. Curtis, J.F. Klaverkamp, C.L. Baro. Vitamin and Thyroid Status in Arctic Grayling (Thymallus arcticus) Exposed to Doses of 3,3',4,4'-Tetrachlorobiphenyl that Induce the Phase I Enzyme System. Chemosphere45(2): 185-193.
PCB 1254	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	2000	NA	NR	ug/L	LAB	1973. Peterson, R.H.. Temperature Selection of Atlantic Salmon (Salmo salar) and Brook Trout (Salvelinus fontinalis) as Influenced by Various Chlorinated Hydrocarbons. J. Fish. Res. Board Can.30(8): 1091-1097.
PCB 1254	Bloater	Fish	Fresh	Mortality	LC50	Not Reported	A	3200	NA	NR	ug/L	LAB	1980. Passino, D.R.M., and J.M. Kramer. Toxicity of Arsenic and PCBs to Fry of Deepwater Ciscoes (Coregonus). Bull. Environ. Contam. Toxicol.24(4): 527-534.
PCB 1254	Bloater	Fish	Fresh	Mortality	NR-LETH	Not Reported	A	1000	NA	NR	ug/L	LAB	1980. Passino, D.R.M., and J.M. Kramer. Toxicity of Arsenic and PCBs to Fry of Deepwater Ciscoes (Coregonus). Bull. Environ. Contam. Toxicol.24(4): 527-534.
4-Chloro-1,1'-biphenyl	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	1300	NA	NR	ug/L	LAB	1982. Dill, D.C., M.A. Mayes, C.G. Mendoza, G.U. Boggs, and J.A. Emmitte. Comparison of the Toxicities of Biphenyl, Monochlorobiphenyl, and 2,2',4,4'-Tetrachlorobiphenyl to Fish and Daphnids. In: J.G.Pearson, R.B.Foster, and W.E.Bishop (Eds.), Aquatic Toxicology and Hazard Assessment, 5th Conference, ASTM STP 766, Philadelphia, PA: 245-256.
PCB 1260	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	245	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1260	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	245	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1260	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	212	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1260	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	212	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1260	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	151	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1260	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	151	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1260	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	400	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	443	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	443	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	204	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	204	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	303	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	135	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	260	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	135	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	54	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	54	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	239	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	177	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	2740	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	2740	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1242	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	72	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1242	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	72	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1242	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	54	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1242	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	54	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1242	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	164	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1242	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	125	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1242	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	120	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1242	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	84	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1242	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	A	154	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1242	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	125	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1242	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	154	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Brook Trout	Fish	Fresh	Growth	NOEC	Whole Organism	F	3.5	NR	NR	mg	LAB	1979. Addison, R.F., M.E. Zinck, D.E. Willis, and D.C. Darrow. Induction of Hepatic Mixed Function Oxidases in Trout by Polychlorinated Biphenyls and Butylated Monochlorodiphenyl Ethers. Toxicol. Appl. Pharmacol.49: 245-248.
PCB 1254	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1976. Snarski, V.M., and F.A. Puglisi. Effects of Aroclor 1254 on Brook Trout, Salvelinus fontinalis. EPA-600/3-76-112, U.S.EPA, Duluth, MN: 42 p..
PCB 1254	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1976. Snarski, V.M., and F.A. Puglisi. Effects of Aroclor 1254 on Brook Trout, Salvelinus fontinalis. EPA-600/3-76-112, U.S.EPA, Duluth, MN: 42 p..
PCB 1254	Brook Trout	Fish	Fresh	Growth	NR		F	6.2	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and R.A. Schoettger. Collagen Metabolism in Fish Exposed to Organic Chemicals. In: R.A.Tubbs (Ed), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium: 31-54.
PCB 1254	Brook Trout	Fish	Fresh	Growth	NR		F	1.65	NA	NR	mg/dose	LAB	1978. Addison, R.F., M.E. Zinck, and D.E. Willis. Induction of Hepatic Mixed-Function Oxidase (MFO) Enzymes in Trout (Salvelinus fontinalis) by Feeding Aroclor 1254 or 3-Methylcholanthrene. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.61(2): 323-325.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Brook Trout	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	F	5000	NA	NR	ug/L	LAB	1995. Ndayibagira, A., M.J. Cloutier, P.D. Anderson, and P.A. Spear. Effects of 3,3',4,4'-Tetrachlorobiphenyl on the Dynamics of Vitamin A in Brook Trout (Salvelinus fontinalis) and Intestinal Retinoid Concentrations in Lake Sturgeon (Acipenser fulvescens). Can. J. Fish. Aquat. Sci.52(3): 512-520.
PCB 1254	Brook Trout	Fish	Fresh	Mortality	NR	Egg	F	200	NA	NR	ug/L	LAB	1975. Freeman, H.C., and D.R. Idler. The Effect of Polychlorinated Biphenyl on Steroidogenesis and Reproduction in the Brook Trout (Salvelinus fontinalis). Can. J. Biochem.53(6): 666-670.
PCB 1254	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1976. Snarski, V.M., and F.A. Puglisi. Effects of Aroclor 1254 on Brook Trout, Salvelinus fontinalis. EPA-600/3-76-112, U.S.EPA, Duluth, MN: 42 p..
PCB 1254	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1976. Snarski, V.M., and F.A. Puglisi. Effects of Aroclor 1254 on Brook Trout, Salvelinus fontinalis. EPA-600/3-76-112, U.S.EPA, Duluth, MN: 42 p..
PCB 1254	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	F	100000	NA	NR	ug/L	LAB	1975. Miller, D.L., and D.M. Ogilvie. Temperature Selection in Brook Trout (Salvelinus fontinalis) Following Exposure to DDT, PCB or Phenol. Bull. Environ. Contam. Toxicol.14(5): 545-551.
PCB 1254	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	A	1.5	NA	NR	ug/L	LAB	1978. Mauck, W.L., P.M. Mehrle, and F.L. Mayer. Effects of the Polychlorinated Biphenyl Aroclor 1254 on Growth, Survival, and Bone Development in Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.35(8): 1084-1088.
PCB 1254	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	A	3.1	NA	NR	ug/L	LAB	1978. Mauck, W.L., P.M. Mehrle, and F.L. Mayer. Effects of the Polychlorinated Biphenyl Aroclor 1254 on Growth, Survival, and Bone Development in Brook Trout (Salvelinus fontinalis). J. Fish. Res. Board Can.35(8): 1084-1088.
PCB 1254	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	F	3.1	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and R.A. Schoettger. Collagen Metabolism in Fish Exposed to Organic Chemicals. In: R.A.Tubbs (Ed), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium: 31-54.
PCB 1254	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	F	6.2	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and R.A. Schoettger. Collagen Metabolism in Fish Exposed to Organic Chemicals. In: R.A.Tubbs (Ed), EPA-600/3-77-085, Recent Advances in Fish Toxicology - A Symposium: 31-54.
PCB 1254	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	F	100000	NA	NR	ug/L	LAB	1975. Miller, D.L., and D.M. Ogilvie. Temperature Selection in Brook Trout (Salvelinus fontinalis) Following Exposure to DDT, PCB or Phenol. Bull. Environ. Contam. Toxicol.14(5): 545-551.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1254	Brook Trout	Fish	Fresh	Reproduction	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1976. Snarski, V.M., and F.A. Puglisi. Effects of Aroclor 1254 on Brook Trout, Salvelinus fontinalis. EPA-600/3-76-112, U.S.EPA, Duluth, MN: 42 p..
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Channel Catfish	Fish	Fresh	Growth	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1995. Rice, C.D., and D. Schlenk. Immune Function and Cytochrome P4501A Activity After Acute Exposure to 3,3',4,4',5-Pentachlorobiphenyl (PCB 126) in Channel Catfish. J. Aquat. Anim. Health7(3): 195-204.
PCB 1242	Channel Catfish	Fish	Fresh	Growth	NR	Not Reported	F	20000	NA	NR	ug/L	LAB	1976. Hansen, L.G., W.B. Wiekhorst, and J. Simon. Effects of Dietary Aroclor 1242 on Channel Catfish (Ictalurus punctatus) and the Selective Accumulation of PCB Components. J. Fish. Res. Board Can.33(6): 1343-1352.
PCB 1260	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	535	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1260	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	482	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1260	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	A	296	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1260	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	296	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1260	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	512	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1260	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	A	166	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1260	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	166	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1260	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	465	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1260	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	A	137	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1260	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	137	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1260	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	433	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	303	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	A	741	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	741	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	286	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	300	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	293	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	A	300	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	A	113	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	113	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	181	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	139	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	1.76	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 44 p..
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	A	12000	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	12000	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1242	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	A	174	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1242	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	174	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1242	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	A	107	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1242	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	107	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1242	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	219	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1242	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	150	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1242	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	132	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1242	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	F	87	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NOEC	Whole Organism	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NR	Whole Organism	A	NR	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Growth	NR	Whole Organism	A	NR	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	A	17000	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	A	17000	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	A	17000	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
PCB 1254	Chinook Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	A	6800	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
4-Chloro-1,1'-biphenyl	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
PCB 1254	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
PCB 1242	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
PCB 1254	Chinook Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	800000	NR	NR	ug/L	LAB	2003. Powell, D.B., R.C.,Jr. Palm, A. Skillman, and K. Godtfredsen. Immunocompetence of Juvenile Chinook Salmon Against Listonella anguillarum Following Dietary Exposure to Aroclor 1254. Environ. Toxicol. Chem.22(2): 285-295.
1,1'-Biphenyl, Chloro derivs.	Salmon,Silver S	Fish	Fresh	Growth	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1976. Gruger, E.H.,Jr., T. Hruby, and N.L. Karrick. Sublethal Effects of Structurally Related Tetrachloro-, Pentachloro-, and Hexachlorobiphenyl on Juvenile Coho Salmon. Environ. Sci. Technol.10(10): 1033-1037.
1,1'-Biphenyl, Chloro derivs.	Salmon,Silver S	Fish	Fresh	Growth	NR	Whole Organism	A	10100	NR	NR	ug/L	LAB	1975. Gruger, E.H.,Jr., N.L. Karrick, A.I. Davidson, and T. Hruby. Accumulation of 3,4,3',4'-Tetrachlorobiphenyl and 2,4,5,2',4',5'- and 2,4,6,2',4',6'-Hexachlorobiphenyl in Juvenille Coho Salmon. Environ. Sci. Technol.9(2): 121-127.
1,1'-Biphenyl, Chloro derivs.	Salmon,Silver S	Fish	Fresh	Growth	NR		F	500000	NA	NR	ug/L	LAB	1978. Leatherland, J.F., and R.A. Sonstegard. Lowering of Serum Thyroxine and Triiodothyronine Levels in Yearling Coho Salmon, Oncorhynchus kisutch, by Dietary Mirex and PCBs. J. Fish. Res. Board Can.35(10): 1285-1289.
PCB 1254	Salmon,Silver S	Fish	Fresh	Growth	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1974. Halter, M.T.. The Acute Toxicity of Polychlorinated Biphenyl, Aroclor 1254, to the Early Life Stages of Coho Salmon and Steelhead Trout. Aug.4 PCB Newsl., U.S.EPA, Duluth, MN: 3 p..
PCB 1254	Salmon,Silver S	Fish	Fresh	Growth	NR		A	15.4	NA	NR	ug/L	LAB	1974. Halter, M.T., and H.E. Johnson. Acute Toxicities of a Polychlorinated Biphenyl (PCB) and DDT Alone and in Combination to Early Life Stages of Coho Salmon (Oncorhynchus kisutch). J. Fish. Res. Board Can.31(9): 1543-1547.
PCB 1254	Salmon,Silver S	Fish	Fresh	Growth	NR		A	7.8	NA	NR	ug/L	LAB	1974. Halter, M.T., and H.E. Johnson. Acute Toxicities of a Polychlorinated Biphenyl (PCB) and DDT Alone and in Combination to Early Life Stages of Coho Salmon (Oncorhynchus kisutch). J. Fish. Res. Board Can.31(9): 1543-1547.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Salmon,Silver S	Fish	Fresh	Growth	NR	Not Reported	F	10	NA	NR	mg	LAB	1976. Gruger, E.H.,Jr., T. Hruby, and N.L. Karrick. Sublethal Effects of Structurally Related Tetrachloro-, Pentachloro-, and Hexachlorobiphenyl on Juvenile Coho Salmon. Environ. Sci. Technol.10(10): 1033-1037.
1,1'-Biphenyl, Chloro derivs.	Salmon,Silver S	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1974. Halter, M.T.. The Acute Toxicity of Polychlorinated Biphenyl, Aroclor 1254, to the Early Life Stages of Coho Salmon and Steelhead Trout. Aug.4 PCB Newsl., U.S.EPA, Duluth, MN: 3 p..
PCB 1254	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1974. Halter, M.T.. The Acute Toxicity of Polychlorinated Biphenyl, Aroclor 1254, to the Early Life Stages of Coho Salmon and Steelhead Trout. Aug.4 PCB Newsl., U.S.EPA, Duluth, MN: 3 p..
PCB 1254	Salmon,Silver S	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
PCB 1254	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	A	15.4	NA	NR	ug/L	LAB	1974. Halter, M.T., and H.E. Johnson. Acute Toxicities of a Polychlorinated Biphenyl (PCB) and DDT Alone and in Combination to Early Life Stages of Coho Salmon (Oncorhynchus kisutch). J. Fish. Res. Board Can.31(9): 1543-1547.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1254	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	A	7.8	NA	NR	ug/L	LAB	1974. Halter, M.T., and H.E. Johnson. Acute Toxicities of a Polychlorinated Biphenyl (PCB) and DDT Alone and in Combination to Early Life Stages of Coho Salmon (Oncorhynchus kisutch). J. Fish. Res. Board Can.31(9): 1543-1547.
PCB 1242	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
PCB 1254	Coho Salmon,Silver Salmon	Fish	Fresh	Reproduction	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1974. Halter, M.T.. The Acute Toxicity of Polychlorinated Biphenyl, Aroclor 1254, to the Early Life Stages of Coho Salmon and Steelhead Trout. Aug.4 PCB Newsl., U.S.EPA, Duluth, MN: 3 p..
PCB 1260	Common Barbel	Fish	Fresh	Reproduction	NR	lultiple Tissue/Orga	F	NR	NR	NR	ug/L	LAB	1999. Hugla, J.L., and J.P. Thome. Effects of Polychlorinated Biphenyls on Liver Ultrastructure, Hepatic Monooxygenases, and Reproductive Success in the Barbel. Ecotoxicol. Environ. Saf.42(3): 265-273.
PCB 1260	Common Barbel	Fish	Fresh	Reproduction	NR	Not Reported	F	12500	NA	NR	ug/L	LAB	1993. Hugla, J.L., J.P. Thome, and J.C. Philippart. PCBs Contamination of Aquatic Ecosystems Related to Reproductive Success in a Sensitive Fish Species, Barbus barbus. Cah. Ethol.13(2): 155-158.
PCB 1242	Common Carp	Fish	Fresh	Growth	NOEC	Whole Organism	A	NR	NR	NR	ug/L	LAB	2006. Fisher, M.A., C. Mehne, J.C. Means, and C.F. Ide. Induction of CYP1A mRNA in Carp (Cyprinus carpio) from the Kalamazoo River Polychlorinated Biphenyl-Contaminated Superfund Site and in a Laboratory Study. Arch. Environ. Contam. Toxicol.50(1): 14-22.
PCB 1242	Common Carp	Fish	Fresh	Growth	NOEC	Whole Organism	A	NR	NR	NR	ug/L	LAB	2006. Fisher, M.A., C. Mehne, J.C. Means, and C.F. Ide. Induction of CYP1A mRNA in Carp (Cyprinus carpio) from the Kalamazoo River Polychlorinated Biphenyl-Contaminated Superfund Site and in a Laboratory Study. Arch. Environ. Contam. Toxicol.50(1): 14-22.
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3,3',4,4',5-Pentachloro-1,1'-biphenyl	Common Carp	Fish	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	mol/L	LAB	1998. Stouthart, X.J.H.X., M.A.J. Huijbregts, P.H.M. Balm, R.A.C. Lock, and S.E. Wendelaar Bonga. Endocrine Stress Response and Abnormal Development in Carp (Cyprinus carpio) Larvae After Exposure of the Embryos to PCB 126. Fish Physiol. Biochem.18(4): 321-329.
2,3,4,5,6-Pentachlorobenzenemethanol	Common Carp	Fish	Fresh	Mortality	LC50*	Not Reported	F	1800	NA	NR	ug/L	NR	1967. Nishiuchi, Y., and Y. Hashimoto. Toxicity of Pesticide Ingredients to Some Fresh Water Organisms. Sci. Pest Control (Botyu-Kagaku)32(1): 5-11.
2,3,4,5,6-Pentachlorobenzenemethanol	Common Carp	Fish	Fresh	Mortality	LD50	Not Reported	F	7.8	NA	NR	mg/fish	LAB	1969. Hashimoto, Y., and J.I. Fukami. Toxicity of Orally and Topically Applied Pesticide Ingredients to Carp, Cyprinus carpio Linne. Botyu-Kagaku34(2): 63-66.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	mol/L	LAB	1998. Stouthart, X.J.H.X., M.A.J. Huijbregts, P.H.M. Balm, R.A.C. Lock, and S.E. Wendelaar Bonga. Endocrine Stress Response and Abnormal Development in Carp (Cyprinus carpio) Larvae After Exposure of the Embryos to PCB 126. Fish Physiol. Biochem.18(4): 321-329.
PCB 1242	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	NR	NR	NR	ug/L	LAB	2006. Fisher, M.A., C. Mehne, J.C. Means, and C.F. Ide. Induction of CYP1A mRNA in Carp (Cyprinus carpio) from the Kalamazoo River Polychlorinated Biphenyl-Contaminated Superfund Site and in a Laboratory Study. Arch. Environ. Contam. Toxicol.50(1): 14-22.
PCB 1260	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	61800	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1260	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	60900	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1260	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	60900	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1254	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	44900	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1254	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	42500	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	42500	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1242	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	5430	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1242	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	5420	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1242	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	5400	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1260	Cutthroat Trout	Fish	Fresh	Mortality	LC50*	Not Reported	F	25000	NA	NR	ug/L	LAB	1969. Swedburg, D.. Chronic Toxicity of Insecticides to Cold-Water Fish. Prog.Sport.Fish.Res., Div.Fish Res., Bureau Sport Fish Wildl.88: 8-9.

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2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	F	2.5	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	F	2.5	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5,5'-Heptachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	F	2.5	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	F	2.5	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
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2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Growth	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1260	Fathead Minnow	Fish	Fresh	Growth	NR		A	2.1	NA	NR	ug/L	LAB	1978. DeFoe, D.L., G.D. Veith, and R.W. Carlson. Effects of Aroclor 1248 and 1260 on the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.35(7): 997-1002.
PCB 1260	Fathead Minnow	Fish	Fresh	Growth	NR		A	1.3	NA	NR	ug/L	LAB	1978. DeFoe, D.L., G.D. Veith, and R.W. Carlson. Effects of Aroclor 1248 and 1260 on the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.35(7): 997-1002.
PCB 1260	Fathead Minnow	Fish	Fresh	Growth	NR		A	3	NA	NR	ug/L	LAB	1978. DeFoe, D.L., G.D. Veith, and R.W. Carlson. Effects of Aroclor 1248 and 1260 on the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.35(7): 997-1002.
PCB 1254	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1974. Nebeker, A.V., F.A. Puglisi, and D.L. DeFoe. Effect of Polychlorinated Biphenyl Compounds on Survival and Reproduction of the Fathead Minnow and Flagfish. Trans. Am. Fish. Soc.103(3): 562-568.
PCB 1260	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	3.3	NA	NR	ug/L	LAB	1978. DeFoe, D.L., G.D. Veith, and R.W. Carlson. Effects of Aroclor 1248 and 1260 on the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.35(7): 997-1002.
PCB 1254	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	7.7	NA	NR	ug/L	LAB	1974. Nebeker, A.V., F.A. Puglisi, and D.L. DeFoe. Effect of Polychlorinated Biphenyl Compounds on Survival and Reproduction of the Fathead Minnow and Flagfish. Trans. Am. Fish. Soc.103(3): 562-568.
2,2',5-Trichloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	33.8	NA	NR	ug/L	LAB	1993. Black, M.C., W. Burton, J.F. McCarthy, M.J. Peterson, and G.R. Southworth. Accumulation of Contaminants by Biota in East Fork Poplar Creek. In: Oak Ridge Y12 Plant, Environ.Sci.Div.Publ.No.3859, Oak Ridge Natl.Lab., Oak Ridge, TN4: 109-172.
PCB 1242	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	A	15	NA	NR	ug/L	LAB	1974. Nebeker, A.V., F.A. Puglisi, and D.L. DeFoe. Effect of Polychlorinated Biphenyl Compounds on Survival and Reproduction of the Fathead Minnow and Flagfish. Trans. Am. Fish. Soc.103(3): 562-568.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5,5'-Heptachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5,5'-Heptachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,4,4'-Trichloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	1.5	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
PCB 1260	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	0.1	NA	NR	ug/L	LAB	1978. DeFoe, D.L., G.D. Veith, and R.W. Carlson. Effects of Aroclor 1248 and 1260 on the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.35(7): 997-1002.
2,3,4,5,6-Pentachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	2.8	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	0.3	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	1.3	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
2,2',5-Trichloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	86	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	1.2	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
2,2',3,3',4,4'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	0.4	NA	NR	ug/L	LAB	1991. Dillon, T.M., and W.D.S. Burton. Acute Toxicity of PCB Congeners to Daphnia magna and Pimephales promelas. Bull. Environ. Contam. Toxicol.46(2): 208-215.
PCB 1242	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1974. Nebeker, A.V., F.A. Puglisi, and D.L. DeFoe. Effect of Polychlorinated Biphenyl Compounds on Survival and Reproduction of the Fathead Minnow and Flagfish. Trans. Am. Fish. Soc.103(3): 562-568.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	2.5	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	2.5	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5,5'-Heptachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5,5'-Heptachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',3,4,4',5,5'-Heptachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
2,2',4,5,5'-Pentachloro-1,1'-biphenyl	Fathead Minnow	Fish	Fresh	Reproduction	NOEC	Not Reported	F	25	NR	NR	ug/L	LAB	1997. Suedel, B.C., T.M. Dillon, and W.H. Benson. Subchronic Effects of Five di-Ortho PCB Congeners on Survival, Growth and Reproduction in the Fathead Minnow Pimephales promelas. Environ. Toxicol. Chem.16(7): 1526-1532.
PCB 1260	Fathead Minnow	Fish	Fresh	Reproduction	NR		A	2.1	NA	NR	ug/L	LAB	1978. DeFoe, D.L., G.D. Veith, and R.W. Carlson. Effects of Aroclor 1248 and 1260 on the Fathead Minnow (Pimephales promelas). J. Fish. Res. Board Can.35(7): 997-1002.
PCB 1254	Fathead Minnow	Fish	Fresh	Reproduction	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1974. Nebeker, A.V., F.A. Puglisi, and D.L. DeFoe. Effect of Polychlorinated Biphenyl Compounds on Survival and Reproduction of the Fathead Minnow and Flagfish. Trans. Am. Fish. Soc.103(3): 562-568.
PCB 1242	Fathead Minnow	Fish	Fresh	Reproduction	NR	Not Reported	A	NR	NA	NR	ug/L	LAB	1974. Nebeker, A.V., F.A. Puglisi, and D.L. DeFoe. Effect of Polychlorinated Biphenyl Compounds on Survival and Reproduction of the Fathead Minnow and Flagfish. Trans. Am. Fish. Soc.103(3): 562-568.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1254	Golden Shiner	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	10	NA	NR	ug/L	LAB	1992. Karara, A.H., and V.A. McFarland. A Pharmacokinetic Analysis of the Uptake of Polychlorinated Biphenyls (PCBs) by Golden Shiners. Environ. Toxicol. Chem.11(3): 315-320.
PCB 1254	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	F	1.18	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 44 p..
2,3,4,5,6-Pentachlorobenzenemethanol	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	F	1300	NA	NR	ug/L	NR	1967. Nishiuchi, Y., and Y. Hashimoto. Toxicity of Pesticide Ingredients to Some Fresh Water Organisms. Sci. Pest Control (Botyu-Kagaku)32(1): 5-11.
PCB 1242	Guppy	Fish	Fresh	Mortality	NR	Not Reported	F	200	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Guppy	Fish	Fresh	Mortality	NR	Not Reported	F	20	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1254	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	5000	NA	NR	ug/L	LAB	1983. Gooch, J.A., and M.K. Hamdy. Uptake and Concentration Factor of Aroclor 1254 in Aquatic Organisms. Bull. Environ. Contam. Toxicol.31(4): 445-452.
PCB 1254	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	20000	NA	NR	ug/L	LAB	1983. Gooch, J.A., and M.K. Hamdy. Uptake and Concentration Factor of Aroclor 1254 in Aquatic Organisms. Bull. Environ. Contam. Toxicol.31(4): 445-452.
PCB 1242	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	2000	NR	NR	ug/L	LAB	1972. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. Bull. Environ. Contam. Toxicol.8(3): 129-137.
PCB 1242	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	2000	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1242	Guppy	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	2000	NA	NR	ug/L	LAB	1971. Morgan, J.R.. Effects of Aroclor 1242 (a Polychlorinated Biphenyl) and DDT on Cultures of an Alga, Protozoan, Daphnid, Ostracod, and Guppy. M.S.Thesis, University of Washington, Seattle, WA: 95 p..
PCB 1254	quinfish, Red Ra	Fish	Fresh	Mortality	LC50	Not Reported	F	6200	NA	NR	ug/L	LAB	1975. Tooby, T.E., P.A. Hursey, and J.S. Alabaster. Acute Toxicity of 102 Pesticides and Miscellaneous Substances to Fish. Chem. Ind. (Lond.)21: 523-526.
PCB 1254	quinfish, Red Ra	Fish	Fresh	Mortality	LC50	Not Reported	F	1450	NA	NR	ug/L	LAB	1975. Tooby, T.E., P.A. Hursey, and J.S. Alabaster. Acute Toxicity of 102 Pesticides and Miscellaneous Substances to Fish. Chem. Ind. (Lond.)21: 523-526.
PCB 1254	quinfish, Red Ra	Fish	Fresh	Mortality	LC50	Not Reported	F	1100	NA	NR	ug/L	LAB	1975. Tooby, T.E., P.A. Hursey, and J.S. Alabaster. Acute Toxicity of 102 Pesticides and Miscellaneous Substances to Fish. Chem. Ind. (Lond.)21: 523-526.
PCB 1242	quinfish, Red Ra	Fish	Fresh	Mortality	LC50	Not Reported	F	960	NA	NR	ug/L	LAB	1975. Tooby, T.E., P.A. Hursey, and J.S. Alabaster. Acute Toxicity of 102 Pesticides and Miscellaneous Substances to Fish. Chem. Ind. (Lond.)21: 523-526.
PCB 1242	quinfish, Red Ra	Fish	Fresh	Mortality	LC50	Not Reported	F	600	NA	NR	ug/L	LAB	1975. Tooby, T.E., P.A. Hursey, and J.S. Alabaster. Acute Toxicity of 102 Pesticides and Miscellaneous Substances to Fish. Chem. Ind. (Lond.)21: 523-526.
PCB 1242	quinfish, Red Ra	Fish	Fresh	Mortality	LC50	Not Reported	F	370	NA	NR	ug/L	LAB	1975. Tooby, T.E., P.A. Hursey, and J.S. Alabaster. Acute Toxicity of 102 Pesticides and Miscellaneous Substances to Fish. Chem. Ind. (Lond.)21: 523-526.
PCB 1254	ke Trout, Siscov	Fish	Fresh	Growth	NR	Not Reported	A	720	NA	NR	ug/L	LAB	1981. Mac, M.J., and J.G. Seelye. Patterns of PCB Accumulation by Fry of Lake Trout. Bull. Environ. Contam. Toxicol.27(3): 368-375.
PCB 1254	ke Trout, Siscov	Fish	Fresh	Growth	NR	Not Reported	A	720	NA	NR	ug/L	LAB	1981. Mac, M.J., and J.G. Seelye. Potential Influence of Acetone in Aquatic Bioassays Testing the Dynamics and Effects of PCBs. Bull. Environ. Contam. Toxicol.27(3): 359-367.
PCB 1254	ke Trout, Siscov	Fish	Fresh	Growth	NR	Not Reported	A	720	NA	NR	ug/L	LAB	1981. Mac, M.J., and J.G. Seelye. Potential Influence of Acetone in Aquatic Bioassays Testing the Dynamics and Effects of PCBs. Bull. Environ. Contam. Toxicol.27(3): 359-367.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	ke Trout, Siscov	Fish	Fresh	Growth	NR	Whole Organism	A	NR	NR	NR	AI ug/kg	LAB	2004. Brown, S.B., R.E. Evans, L. Vandenbyllardt, K.W. Finnson, V.P. Palace, A.S. Kane, A.Y. Yarechewski, and D.C.G. Muir. Altered Thyroid Status in Lake Trout (Salvelinus namaycush) Exposed to Co-Planar 3,3',4,4',5-Pentachlorobiphenyl. Aquat. Toxicol.67(1): 75-85.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	ke Trout, Siscov	Fish	Fresh	Growth	NR	Whole Organism	A	NR	NR	NR	AI ug/kg	LAB	2004. Brown, S.B., R.E. Evans, L. Vandenbyllardt, K.W. Finnson, V.P. Palace, A.S. Kane, A.Y. Yarechewski, and D.C.G. Muir. Altered Thyroid Status in Lake Trout (Salvelinus namaycush) Exposed to Co-Planar 3,3',4,4',5-Pentachlorobiphenyl. Aquat. Toxicol.67(1): 75-85.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	ke Trout, Siscov	Fish	Fresh	Growth	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1993. Brown, S.B., R.E. Evans, W.L. Lockhart, D.A. Metner, D.C.G. Muir, and A. Yarachewski. Biochemical and Histological Responses to Coplanar 3,3',4,4',5-Pentachlorobiphenyl in Lake Trout (Salvelinus namaycush). In: Prog. Abstr. 36th Conf. Int. Assoc. Great Lakes Res. , June 4-10, 1993, St. Norbert College, De Pere, WI: 111.
PCB 1254	ke Trout, Siscov	Fish	Fresh	Mortality	NR	Not Reported	A	0.208	NA	NR	ug/L	LAB	1981. Willford, W.A., N.R. Foster, R.E. Reinert, W.H. Berlin, R.J. Hesselberg, D.V. Rottiers, M.J. Mac, and D.M. Passino. Chlorinated Hydrocarbons as a Factor in the Reproduction and Survival of Lake Trout (Salvelinus namaycush) in Lake Michigan. Tech.Pap.No.105, Bur.Sport Fish.Wildl., Fish Wildl.Serv., U.S.D.I., Washington, DC: 42 p..
PCB 1254	ke Trout, Siscov	Fish	Fresh	Mortality	NR	Not Reported	A	720	NA	NR	ug/L	LAB	1981. Mac, M.J., and J.G. Seelye. Patterns of PCB Accumulation by Fry of Lake Trout. Bull. Environ. Contam. Toxicol.27(3): 368-375.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1254	ke Trout, Siscov	Fish	Fresh	Mortality	NR	Not Reported	A	720	NA	NR	ug/L	LAB	1981. Mac, M.J., and J.G. Seelye. Potential Influence of Acetone in Aquatic Bioassays Testing the Dynamics and Effects of PCBs. Bull. Environ. Contam. Toxicol.27(3): 359-367.
PCB 1254	ke Trout, Siscov	Fish	Fresh	Mortality	NR	Not Reported	A	720	NA	NR	ug/L	LAB	1981. Mac, M.J., and J.G. Seelye. Potential Influence of Acetone in Aquatic Bioassays Testing the Dynamics and Effects of PCBs. Bull. Environ. Contam. Toxicol.27(3): 359-367.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	edaka, High-Eye	Fish	Fresh	Mortality	EC50	Not Reported	F	2300	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	edaka, High-Eye	Fish	Fresh	Mortality	EC50	Not Reported	F	0.45	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	F	600	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	edaka, High-Eye	Fish	Fresh	Mortality	LC50	Not Reported	F	0.25	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	F	0.215	NA	NR	ug/L	LAB	1994. Harris, G.E., Y. Kiparissis, and C.D. Metcalfe. Assessment of the Toxic Potential of PCB Congener 81 (3,4,4'5-Tetrachlorobiphenyl) to Fish in Relation to Other Non-Ortho-Substituted PCB Congeners. Environ. Toxicol. Chem.13(9): 1405-1413.
3,4,4',5-Tetrachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	F	15.585	NA	NR	ug/L	LAB	1994. Harris, G.E., Y. Kiparissis, and C.D. Metcalfe. Assessment of the Toxic Potential of PCB Congener 81 (3,4,4'5-Tetrachlorobiphenyl) to Fish in Relation to Other Non-Ortho-Substituted PCB Congeners. Environ. Toxicol. Chem.13(9): 1405-1413.
2,3,4,5,6-Pentachlorobenzenemethanol	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50*	Not Reported	F	2000	NA	NR	ug/L	NR	1967. Nishiuchi, Y., and Y. Hashimoto. Toxicity of Pesticide Ingredients to Some Fresh Water Organisms. Sci. Pest Control (Botyu-Kagaku)32(1): 5-11.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NOEC	Not Reported	F	1000	NR	NR	ug/L	LAB	2003. Duffy, J.E., E.A. Carlson, Y. Li, C. Prophete, and J.T. Zelikoff. Age-Related Differences in the Sensitivity of the Fish Immune Response to a Coplanar PCB. Ecotoxicology12(1-4): 251-259.
2,3,3',4,4'-Pentachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
2,3,3',4,4'-Pentachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	1600	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR-LETH	Not Reported	F	0.8	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
2,3,3',4,4'-Pentachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	500	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	500	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	100	NR	NR	ug/L	LAB	1999. Kim, Y., and K.R. Cooper. Toxicity of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Polychlorinated Biphenyls (PCBs) in the Embryos and Newly Hatched Larvae of the Japanese Medaka (Oryzias latipes). Chemosphere39(3): 527-538.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	NR	NA	NR	ug/L	LAB	1998. Kim, Y., and K.R. Cooper. Interactions of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and 3,3',4,4',5-Pentachlorobiphenyl (PCB 126) for Producing Lethal and Sublethal Effects in the Japanese Medaka Embryos and Larvae. Chemosphere36(2): 409-418.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
2,2',4,5-Tetrachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	750	NR	NR	ug/L	LAB	2005. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo. Early-Life-Stage Toxicity in Offspring from Exposed Parent Medaka, Oryzias latipes, to Mixtures of Tributyltin and Polychlorinated Biphenyls. Environ. Toxicol. Chem.24(3): 591-596.
2,2',4,5-Tetrachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Reproduction	NOEC	Egg	F	750	NR	NR	ug/L	LAB	2005. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo. Early-Life-Stage Toxicity in Offspring from Exposed Parent Medaka, Oryzias latipes, to Mixtures of Tributyltin and Polychlorinated Biphenyls. Environ. Toxicol. Chem.24(3): 591-596.
2,2',4,5-Tetrachloro-1,1'-biphenyl	Medaka, High-Eyes	Fish	Fresh	Reproduction	NOEC	Not Reported	F	750	NR	NR	ug/L	LAB	2005. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo. Early-Life-Stage Toxicity in Offspring from Exposed Parent Medaka, Oryzias latipes, to Mixtures of Tributyltin and Polychlorinated Biphenyls. Environ. Toxicol. Chem.24(3): 591-596.
2,4',5-Trichloro-1,1'-biphenyl	Minnow,Carp Family	Fish	Fresh	Growth	NR	Not Reported	F	NR	NA	NR	ml	LAB	1994. Svobodova, Z., B. Vykusova, J. Machova, M. Hrbkova, and L. Groch. The Long-Term Effect of PCBs on Fish. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 8, Fishing News Books, London: 88-98.
2,4',5-Trichloro-1,1'-biphenyl	Minnow,Carp Family	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NA	NR	ml	LAB	1994. Svobodova, Z., B. Vykusova, J. Machova, M. Hrbkova, and L. Groch. The Long-Term Effect of PCBs on Fish. In: R.Muller and R.Lloyd (Eds.), Sublethal and Chronic Effects of Pollutants on Freshwater Fish, Chapter 8, Fishing News Books, London: 88-98.
PCB 1254	orthern Squawfis	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
PCB 1242	orthern Squawfis	Fish	Fresh	Mortality	NR	Not Reported	F	10000	NA	NR	ug/L	LAB	1969. MacPhee, C., and R. Ruelle. Lethal Effects of 1888 Chemicals upon Four Species of Fish from Western North America. Bull.No.3, Forest, Wildl.and Range Exp.Stn., Univ.of Idaho, Moscow, ID: 112 p..
1,1'-Biphenyl, Chloro derivs.	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	A	2.9	NR	NR	ug/L	LAB	1985. Mayer, K.S., F.L. Mayer, and A.,Jr. Witt. Waste Transformer Oil and PCB Toxicity to Rainbow Trout. Trans. Am. Fish. Soc.114: 869-886.
1,1'-Biphenyl, Chloro derivs.	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	A	2.9	NR	NR	ug/L	LAB	1985. Mayer, K.S., F.L. Mayer, and A.,Jr. Witt. Waste Transformer Oil and PCB Toxicity to Rainbow Trout. Trans. Am. Fish. Soc.114: 869-886.
PCB 1260	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	A	280	NR	NR	ug/L	LAB	2004. Carline, R.F., P.M. Barry, and H.G. Ketola. Dietary Uptake of Polychlorinated Biphenyls (PCBs) by Rainbow Trout. N. Am. J. Aquacult.66(2): 91-99.
PCB 1260	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	A	280	NR	NR	ug/L	LAB	2004. Carline, R.F., P.M. Barry, and H.G. Ketola. Dietary Uptake of Polychlorinated Biphenyls (PCBs) by Rainbow Trout. N. Am. J. Aquacult.66(2): 91-99.
PCB 1254	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	F	100000	NR	NR	ug/L	LAB	1977. Hendricks, J.D., T.P. Putnam, D.D. Bills, and R.O. Sinnhuber. Inhibitory Effect of a Polychlorinated Biphenyl (Aroclor 1254) on Aflatoxin B1 Carcinogenesis in Rainbow Trout (Salmo gairdneri). J. Natl. Cancer Inst.59: 1545-1551.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	F	1000	NR	NR	ug/L	LAB	1997. Otto, D.M.E., C.K. Sen, N. Hidiroglou, R. Madere, and T.W. Moon. Role of Exogenous Glutathione in Teleost Fish and Its Effects on Antioxidant Defense Responses in Rainbow Trout Exposed to 3,3',4,4'-Tetrachlorobiphenyl. Fish Physiol. Biochem.16: 449-457.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	F	1000	NR	NR	ug/L	LAB	1997. Otto, D.M.E., C.K. Sen, N. Hidiroglou, R. Madere, and T.W. Moon. Role of Exogenous Glutathione in Teleost Fish and Its Effects on Antioxidant Defense Responses in Rainbow Trout Exposed to 3,3',4,4'-Tetrachlorobiphenyl. Fish Physiol. Biochem.16: 449-457.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	F	1000	NR	NR	ug/L	LAB	1997. Otto, D.M.E., C.K. Sen, N. Hidiroglou, R. Madere, and T.W. Moon. Role of Exogenous Glutathione in Teleost Fish and Its Effects on Antioxidant Defense Responses in Rainbow Trout Exposed to 3,3',4,4'-Tetrachlorobiphenyl. Fish Physiol. Biochem.16: 449-457.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	F	1000	NR	NR	ug/L	LAB	1997. Otto, D.M.E., C.K. Sen, N. Hidiroglou, R. Madere, and T.W. Moon. Role of Exogenous Glutathione in Teleost Fish and Its Effects on Antioxidant Defense Responses in Rainbow Trout Exposed to 3,3',4,4'-Tetrachlorobiphenyl. Fish Physiol. Biochem.16: 449-457.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	F	1000	NR	NR	ug/L	LAB	1997. Otto, D.M.E., C.K. Sen, N. Hidiroglou, R. Madere, and T.W. Moon. Role of Exogenous Glutathione in Teleost Fish and Its Effects on Antioxidant Defense Responses in Rainbow Trout Exposed to 3,3',4,4'-Tetrachlorobiphenyl. Fish Physiol. Biochem.16: 449-457.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	F	1000	NR	NR	ug/L	LAB	1997. Otto, D.M.E., C.K. Sen, N. Hidiroglou, R. Madere, and T.W. Moon. Role of Exogenous Glutathione in Teleost Fish and Its Effects on Antioxidant Defense Responses in Rainbow Trout Exposed to 3,3',4,4'-Tetrachlorobiphenyl. Fish Physiol. Biochem.16: 449-457.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	A	50.9	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	A	50.9	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	A	51.5	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	A	51.5	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
1,1'-Biphenyl, Chloro derivs.	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	A	NR	NA	NR	ug/L	FIELDN	1996. Otto, D.M.E., J.K. Buttner, D.M. Arquette, and T.W. Moon. Impaired Inducibility of Xenobiotic and Antioxidant Responses in Rainbow Trout Exposed to Polychlorinated Biphenyl Contaminated Sediments in the St. Lawrence River. Chemosphere33(10): 2021-2032.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
1,1'-Biphenyl, Chloro derivs.	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	A	NR	NR	NR	ug/L	LAB	1985. Mayer, K.S., F.L. Mayer, and A.,Jr. Witt. Waste Transformer Oil and PCB Toxicity to Rainbow Trout. Trans. Am. Fish. Soc.114: 869-886.
1,1'-Biphenyl, Chloro derivs.	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	A	NR	NR	NR	ug/L	LAB	1985. Mayer, K.S., F.L. Mayer, and A.,Jr. Witt. Waste Transformer Oil and PCB Toxicity to Rainbow Trout. Trans. Am. Fish. Soc.114: 869-886.
PCB 1254	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	A	NR	NR	NR	ug/L	LAB	2003. Brambilla, G., G. Cherubini, E. Ferretti, N. Iacovella, S. Menotta, A. Ubaldi, and A. Di Domenico. Polychlorobiphenyl Clearance in Farmed Rainbow Trout: Preliminary Study Results and Development of a Chemobiokinetic Model. Organohalogen Compounds64: 349-352.
PCB 1254	Rainbow Trout	Fish	Fresh	Growth	NR		A	14.7	NA	NR	ug/L	LAB	1982. Snarski, V.M.. The Response of Rainbow Trout Salmo gairdneri to Aeromonas hydrophila After Sublethal Exposures to PCB and Copper. Environ. Pollut. A.28(3): 219-232.
PCB 1254	Rainbow Trout	Fish	Fresh	Growth	NR		F	100000	NA	NR	ug/L	LAB	1980. Hendricks, J.D., T.P. Putman, and R.O. Sinnhuber. Null Effect of Dietary Aroclor 1254 on Hepatocellular Carcinoma Incidence in Rainbow Trout (Salmo gairdneri) Exposed to Aflatoxin B1 as Embryos. J. Environ. Pathol. Toxicol.4(5-6): 9-16.
PCB 1254	Rainbow Trout	Fish	Fresh	Growth	NR		F	30000	NA	NR	ug/L	LAB	1988. Cleland, G.B., P.J. McElroy, and R.A. Sonstegard. The Effect of Dietary Exposure to Aroclor 1254 and/or Mirex on Humoral Immune Expression of Rainbow Trout (Salmo gairdneri). Aquat. Toxicol.12(2): 141-146.
PCB 1254	Rainbow Trout	Fish	Fresh	Growth	NR		F	300000	NA	NR	ug/L	LAB	1988. Cleland, G.B., P.J. McElroy, and R.A. Sonstegard. The Effect of Dietary Exposure to Aroclor 1254 and/or Mirex on Humoral Immune Expression of Rainbow Trout (Salmo gairdneri). Aquat. Toxicol.12(2): 141-146.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	F	5000	NA	NR	ug/L	LAB	1995. Otto, D.M.E., and T.W. Moon. 3,3',4,4'-Tetrachlorobiphenyl Effects on Antioxidant Enzymes and Glutathione Status in Different Tissues of Rainbow Trout. Pharmacol. Toxicol.77(4): 281-287.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	F	5000	NA	NR	ug/L	LAB	1997. Vijayan, M.M., G. Feist, D.M.E. Otto, C.B. Schreck, and T.W. Moon. 3,3',4,4'-Tetrachlorobiphenyl Affects Cortisol Dynamics and Hepatic Function in Rainbow Trout. Aquat. Toxicol.37(2-3): 87-98.
3,3',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug/L	LAB	1999. Donohoe, R.M., J.L. Wang-Buhler, D.R. Buhler, and L.R. Curtis. Effects of 3,3',4,4',5,5'-Hexachlorobiphenyl on Cytochrome P4501A and Estrogen-Induced Vitellogenesis in Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.18(5): 1046-1052.
3,3',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug	LAB	1999. Foster, E.P., and L.R. Curtis. 2,2',4,4',5,5'- and 3,3',4,4',5,5'- Hexachlorobiphenyl Pretreatments Alter the Biliary Excretion of a Challenge Dose of 7,12-[3H]Dimethylbenz(a)anthracene in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.56(4): 642-649.
3,3',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug/L	LAB	1999. Foster, E.P., and L.R. Curtis. 2,2',4,4',5,5'- and 3,3',4,4',5,5'- Hexachlorobiphenyl Pretreatments Alter the Biliary Excretion of a Challenge Dose of 7,12-[3H]Dimethylbenz(a)anthracene in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.56(4): 642-649.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1995. Da Costa, E.G., and L.R. Curtis. Bioaccumulation of Dietary 2,2',4,4',5,5'-Hexachlorobiphenyl and Induction of Hepatic Arylhydrocarbon Hydroxylase in Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.14(10): 1711-1717.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug	LAB	1999. Foster, E.P., and L.R. Curtis. 2,2',4,4',5,5'- and 3,3',4,4',5,5'- Hexachlorobiphenyl Pretreatments Alter the Biliary Excretion of a Challenge Dose of 7,12-[3H]Dimethylbenz(a)anthracene in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.56(4): 642-649.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug/L	LAB	1999. Foster, E.P., and L.R. Curtis. 2,2',4,4',5,5'- and 3,3',4,4',5,5'- Hexachlorobiphenyl Pretreatments Alter the Biliary Excretion of a Challenge Dose of 7,12-[3H]Dimethylbenz(a)anthracene in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.56(4): 642-649.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	A	NR	NR	NR	ug/L	LAB	2002. Brown, S.B., A.T. Fisk, M. Brown, M. Villella, D.C.G. Muir, R.E. Evans, W.L. Lockhart, D.A. Metner, and H.M. Cooley. Dietary Accumulation and Biochemical Responses of Juvenile Rainbow Trout (Oncorhynchus mykiss) to 3,3',4,4',5-pentachlorobiphenyl (PCB 126). Aquat. Toxicol.59: 139-152.
4-Chloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	2010	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
4-Chloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	720	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
4-Chloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	900	NA	NR	ug/L	LAB	1982. Dill, D.C., M.A. Mayes, C.G. Mendoza, G.U. Boggs, and J.A. Emmitte. Comparison of the Toxicities of Biphenyl, Monochlorobiphenyl, and 2,2',4,4'-Tetrachlorobiphenyl to Fish and Daphnids. In: J.G.Pearson, R.B.Foster, and W.E.Bishop (Eds.), Aquatic Toxicology and Hazard Assessment, 5th Conference, ASTM STP 766, Philadelphia, PA: 245-256.
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	240	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	240	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	326	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	94	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	94	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	143	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	21	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	21	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	78	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	49	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	51	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	8	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	8	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	160	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	64	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	39	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	27	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	0.32	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 44 p..
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	A	156	NA	NR	ug/L	LAB	1972. Stalling, D.L., and F.L.,Jr. Mayer. Toxicities of PCBs to Fish and Environmental Residues. Environ. Health Perspect.1: 159-164.
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	142	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	156	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1242	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	39	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
PCB 1242	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	48	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1242	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	18	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1242	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	10	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.
PCB 1242	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	12	NA	NR	ug/L	LAB	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Residue Dynamics and Biological Effects of Polychlorinated Biphenyls in Aquatic Organisms. Arch. Environ. Contam. Toxicol.5(4): 501-511.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1242	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	67	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
PCB 1242	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	109	NR	NR	ug/L	LAB	1970. Schoettger, R.A.. Fish-Pesticide Research Laboratory. In: Publ.No.106, U.S.Dep.Interior, Bur.Sport Fish.Wildl.Res.: 2-40.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	74	NA	NR	ng/g egg	LAB	1991. Walker, M.K., and R.E. Peterson. Potencies of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran, and Biphenyl Congeners, Relative to 2,3,7,8-Tetrachlorodibenzo-p-Dioxin, for Producing Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.21(3/4): 219-238.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	LD50	Not Reported	A	NR	NA	NR	ug/L	LAB	1995. Zabel, E.W., M.K. Walker, M.W. Hornung, M.K. Clayton, and R.E. Peterson. Interactions of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran, and Biphenyl Congeners for Producing Rainbow Trout Early Life Stage Mortality. Toxicol. Appl. Pharmacol.134(2): 204-213.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	LD50	Not Reported	F	1348	NA	NR	ng/g egg	LAB	1991. Walker, M.K., and R.E. Peterson. Potencies of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran, and Biphenyl Congeners, Relative to 2,3,7,8-Tetrachlorodibenzo-p-Dioxin, for Producing Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.21(3/4): 219-238.
3,3',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	LD50	Not Reported	F	7110	NA	NR	ng/g egg	LAB	1995. Zabel, E.W., P.M. Cook, and R.E. Peterson. Toxic Equivalency Factors of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran and Biphenyl Congeners Based on Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.31(4): 315-328.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	LD50	Not Reported	A	NR	NA	NR	ug/L	LAB	1995. Zabel, E.W., M.K. Walker, M.W. Hornung, M.K. Clayton, and R.E. Peterson. Interactions of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran, and Biphenyl Congeners for Producing Rainbow Trout Early Life Stage Mortality. Toxicol. Appl. Pharmacol.134(2): 204-213.
3,4,4',5-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	LD50	Not Reported	F	549	NA	NR	ng/g egg	LAB	1995. Zabel, E.W., P.M. Cook, and R.E. Peterson. Toxic Equivalency Factors of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran and Biphenyl Congeners Based on Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.31(4): 315-328.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	A	500	NR	NR	ug/L	LAB	2000. Koponen, K., P. Lindstrom-Seppa, and J.V.K. Kukkonen. Accumulation Pattern and Biotransformation Enzyme Induction in Rainbow Trout Embryos Exposed to Sublethal Aqueous Concentrations of 3,3',4,4'-Tetrachlorobiphenyl. Chemosphere40(3): 245-253.
1,1'-Biphenyl, Chloro derivs.	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	A	2.9	NR	NR	ug/L	LAB	1985. Mayer, K.S., F.L. Mayer, and A.,Jr. Witt. Waste Transformer Oil and PCB Toxicity to Rainbow Trout. Trans. Am. Fish. Soc.114: 869-886.
1,1'-Biphenyl, Chloro derivs.	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	A	2.9	NR	NR	ug/L	LAB	1985. Mayer, K.S., F.L. Mayer, and A.,Jr. Witt. Waste Transformer Oil and PCB Toxicity to Rainbow Trout. Trans. Am. Fish. Soc.114: 869-886.
1,1'-Biphenyl, Chloro derivs.	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	A	2.9	NR	NR	ug/L	LAB	1985. Mayer, K.S., F.L. Mayer, and A.,Jr. Witt. Waste Transformer Oil and PCB Toxicity to Rainbow Trout. Trans. Am. Fish. Soc.114: 869-886.
1,1'-Biphenyl, Chloro derivs.	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	A	2.9	NR	NR	ug/L	LAB	1985. Mayer, K.S., F.L. Mayer, and A.,Jr. Witt. Waste Transformer Oil and PCB Toxicity to Rainbow Trout. Trans. Am. Fish. Soc.114: 869-886.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	A	100	NR	NR	ug/L	LAB	2000. Koponen, K., P. Lindstrom-Seppa, and J.V.K. Kukkonen. Accumulation Pattern and Biotransformation Enzyme Induction in Rainbow Trout Embryos Exposed to Sublethal Aqueous Concentrations of 3,3',4,4'-Tetrachlorobiphenyl. Chemosphere40(3): 245-253.
PCB 1260	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NR	NR	ug/L	LAB	2004. Carline, R.F., P.M. Barry, and H.G. Ketola. Dietary Uptake of Polychlorinated Biphenyls (PCBs) by Rainbow Trout. N. Am. J. Aquacult.66(2): 91-99.
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NR	NR	ug/L	LAB	2003. Brambilla, G., G. Cherubini, E. Ferretti, N. Iacovella, S. Menotta, A. Ubaldi, and A. Di Domenico. Polychlorobiphenyl Clearance in Farmed Rainbow Trout: Preliminary Study Results and Development of a Chemobiokinetic Model. Organohalogen Compounds64: 349-352.
PCB 1254	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	14.7	NA	NR	ug/L	LAB	1982. Snarski, V.M.. The Response of Rainbow Trout Salmo gairdneri to Aeromonas hydrophila After Sublethal Exposures to PCB and Copper. Environ. Pollut. A.28(3): 219-232.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	A	NR	NR	NR	ug/L	LAB	2000. Koponen, K., P. Lindstrom-Seppa, and J.V.K. Kukkonen. Accumulation Pattern and Biotransformation Enzyme Induction in Rainbow Trout Embryos Exposed to Sublethal Aqueous Concentrations of 3,3',4,4'-Tetrachlorobiphenyl. Chemosphere40(3): 245-253.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	F	1.3	NA	NR	ng/org	LAB	1994. Engwall, M., B. Brunstrom, A. Brewer, and L. Norrgren. Cytochrome P450IA Induction by a Coplanar PCB, a PAH Mixture, and PCB-Contaminated Sediment Extracts Following Microinjection of Rainbow Trout Sac-Fry. Aquat. Toxicol.30(4): 311-324.
1,1'-Biphenyl, Chloro derivs.	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	500000	NR	NR	ug/L	LAB	1980. Leatherland, J.F., and R.A. Sonstegard. Effect of Dietary Mirex and PCBs in Combination with Food Deprivation and Testosterone Administration on Thyroid Activity and Bioaccumulation of Organochlorines in Rainbow Trout Salmo gairdneri Richardson. J. Fish Dis.3(2): 115-124.
1,1'-Biphenyl, Chloro derivs.	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	500000	NR	NR	ug/L	LAB	1980. Leatherland, J.F., and R.A. Sonstegard. Effect of Dietary Mirex and PCBs in Combination with Food Deprivation and Testosterone Administration on Thyroid Activity and Bioaccumulation of Organochlorines in Rainbow Trout Salmo gairdneri Richardson. J. Fish Dis.3(2): 115-124.
2,4,4'-Trichloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	24300	NR	NR	ng/g egg	LAB	1995. Zabel, E.W., P.M. Cook, and R.E. Peterson. Toxic Equivalency Factors of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran and Biphenyl Congeners Based on Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.31(4): 315-328.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
2,2'-Dichloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	24200	NR	NR	ng/g egg	LAB	1995. Zabel, E.W., P.M. Cook, and R.E. Peterson. Toxic Equivalency Factors of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran and Biphenyl Congeners Based on Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.31(4): 315-328.
2,3',4,4',5-Pentachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	57400	NR	NR	ng/g egg	LAB	1995. Zabel, E.W., P.M. Cook, and R.E. Peterson. Toxic Equivalency Factors of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran and Biphenyl Congeners Based on Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.31(4): 315-328.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	5000	NA	NR	ug/L	LAB	1995. Otto, D.M.E., and T.W. Moon. 3,3',4,4'-Tetrachlorobiphenyl Effects on Antioxidant Enzymes and Glutathione Status in Different Tissues of Rainbow Trout. Pharmacol. Toxicol.77(4): 281-287.
2,3,3',4,4'-Pentachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	101000	NR	NR	ng/g egg	LAB	1995. Zabel, E.W., P.M. Cook, and R.E. Peterson. Toxic Equivalency Factors of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran and Biphenyl Congeners Based on Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.31(4): 315-328.
3,3',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	100000	NR	NR	ug/L	LAB	1999. Donohoe, R.M., J.L. Wang-Buhler, D.R. Buhler, and L.R. Curtis. Effects of 3,3',4,4',5,5'-Hexachlorobiphenyl on Cytochrome P4501A and Estrogen-Induced Vitellogenesis in Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.18(5): 1046-1052.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	50.9	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	50.9	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	51.5	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	51.5	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	0.081	NR	NR	ug/L	LAB	1985. Muir, D.C.G., A.L. Yarechewski, and G.R.B. Webster. Bioconcentration of Four Chlorinated Dioxins by Rainbow Trout and Fathead Minnows. In: R.C.Bahner and D.J.Hansen (Eds.), Aquatic Toxicology and Hazard Assessment, 8th Symposium, ASTM STP 891, Philadelphia, PA: 440-454.
2,2',3,4,4',5'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	130000	NR	NR	ng/g egg	LAB	1995. Zabel, E.W., P.M. Cook, and R.E. Peterson. Toxic Equivalency Factors of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran and Biphenyl Congeners Based on Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.31(4): 315-328.
2,2',5,5'-Tetrachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	30400	NR	NR	ng/g egg	LAB	1995. Zabel, E.W., P.M. Cook, and R.E. Peterson. Toxic Equivalency Factors of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran and Biphenyl Congeners Based on Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.31(4): 315-328.
2,2',3,3',4,4'-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	119000	NR	NR	ng/g egg	LAB	1995. Zabel, E.W., P.M. Cook, and R.E. Peterson. Toxic Equivalency Factors of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran and Biphenyl Congeners Based on Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.31(4): 315-328.
2,3,3',4,4',5-Hexachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	F	115000	NR	NR	ng/g egg	LAB	1995. Zabel, E.W., P.M. Cook, and R.E. Peterson. Toxic Equivalency Factors of Polychlorinated Dibenzo-p-Dioxin, Dibenzofuran and Biphenyl Congeners Based on Early Life Stage Mortality in Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.31(4): 315-328.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	126	NR	NR	ug/L	LAB	2002. Brown, S.B., A.T. Fisk, M. Brown, M. Villella, D.C.G. Muir, R.E. Evans, W.L. Lockhart, D.A. Metner, and H.M. Cooley. Dietary Accumulation and Biochemical Responses of Juvenile Rainbow Trout (Oncorhynchus mykiss) to 3,3',4,4',5-pentachlorobiphenyl (PCB 126). Aquat. Toxicol.59: 139-152.
PCB 1254	Redear Sunfish	Fish	Fresh	Mortality	LC50	Not Reported	F	0.53	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 44 p..
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Sea Lamprey	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	F	1000	NR	NR	ug/L	LAB	1998. Hahn, M.E., B.R. Woodin, J.J. Stegeman, and D.E. Tillitt. Aryl Hydrocarbon Receptor Function in Early Vertebrates: Inducibility of Cytochrome P450 1A in Agnathan and Elasmobranch Fish. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.120(1): 67-75.
PCB 1254	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	F	NR	NA	NR	ug/L	LAB	1980. Califano, R.J., J.M. O'Connor, and L.S. Peters. Uptake, Retention, and Elimination of PCB (Aroclor 1254) by Larval Striped Bass (Morone saxatilis). Bull. Environ. Contam. Toxicol.24(3): 467-472.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Striped Bass	Fish	Fresh	Reproduction	NR	Egg	F	1000	NA	NR	ug/L	LAB	1996. Monosson, E., R.G. Hogson, W.J. Fleming, and C.V. Sullivan. Blood Plasma Levels of Sex Steroid Hormones and Vitellogenin in Striped Bass (Morone saxatilis) Exposed to 3,3',4,4'-Tetrachlorobiphenyl (TCB). Bull. Environ. Contam. Toxicol.56(5): 782-787.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	Striped Bass	Fish	Fresh	Reproduction	NR	Not Reported	F	1000	NA	NR	ug/L	LAB	1996. Monosson, E., R.G. Hogson, W.J. Fleming, and C.V. Sullivan. Blood Plasma Levels of Sex Steroid Hormones and Vitellogenin in Striped Bass (Morone saxatilis) Exposed to 3,3',4,4'-Tetrachlorobiphenyl (TCB). Bull. Environ. Contam. Toxicol.56(5): 782-787.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1254	Sunfish	Fish	Fresh	Growth	NR		F	800	NA	NR	ug/L	LAB	1984. Carter, F.D., R.L. Puyear, and J.D. Brammer. Effects of Aroclor 1254 Treatment on the In Vitro Hepatic Metabolism of Toluene, Aniline and Aminopyrine in Hybrid Sunfish. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.78(1): 137-140.
1,1'-Biphenyl, Chloro derivs.	Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	F	0.015	NR	NR	ug/L	LAB	2000. Zhou, H.Y., and M.H. Wong. Accumulation of Sediment-Sorbed PCBs in Tilapia. Water Res.34(11): 2905-2914.
1,1'-Biphenyl, Chloro derivs.	Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	F	0.015	NR	NR	ug/L	LAB	2000. Zhou, H.Y., and M.H. Wong. Accumulation of Sediment-Sorbed PCBs in Tilapia. Water Res.34(11): 2905-2914.
1,1'-Biphenyl, Chloro derivs.	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	A	390	NA	NR	ug/L	LAB	1997. Chaisuksant, Y., Q. Yu, and D. Connell. Internal Lethal Concentrations of Halobenzenes with Fish (Gambusia affinis). Ecotoxicol. Environ. Saf.37: 66-75.
1,1'-Biphenyl, Chloro derivs.	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	A	460	NA	NR	ug/L	LAB	1997. Chaisuksant, Y., Q. Yu, and D. Connell. Internal Lethal Concentrations of Halobenzenes with Fish (Gambusia affinis). Ecotoxicol. Environ. Saf.37: 66-75.
1,1'-Biphenyl, Chloro derivs.	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	A	305	NA	NR	ug/L	LAB	1997. Chaisuksant, Y., Q. Yu, and D. Connell. Internal Lethal Concentrations of Halobenzenes with Fish (Gambusia affinis). Ecotoxicol. Environ. Saf.37: 66-75.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	White Perch	Fish	Fresh	Growth	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1994. Monosson, E., W.J. Fleming, and C.V. Sullivan. Effects of the Planar PCB 3,3',4,4'-Tetrachlorobiphenyl (TCB) on Ovarian Development, Plasma Levels of Sex Steroid Hormones and Vitellogenin, and Progeny Survival in the White Perch (Morone americana). Aquat. Toxicol.29(1-2): 1-19.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	White Perch	Fish	Fresh	Reproduction	NR	Not Reported	F	1000	NA	NR	ug/L	LAB	1994. Monosson, E., W.J. Fleming, and C.V. Sullivan. Effects of the Planar PCB 3,3',4,4'-Tetrachlorobiphenyl (TCB) on Ovarian Development, Plasma Levels of Sex Steroid Hormones and Vitellogenin, and Progeny Survival in the White Perch (Morone americana). Aquat. Toxicol.29(1-2): 1-19.
3,3',4,4'-Tetrachloro-1,1'-biphenyl	White Perch	Fish	Fresh	Reproduction	NR	Not Reported	F	5000	NA	NR	ug/L	LAB	1994. Monosson, E., W.J. Fleming, and C.V. Sullivan. Effects of the Planar PCB 3,3',4,4'-Tetrachlorobiphenyl (TCB) on Ovarian Development, Plasma Levels of Sex Steroid Hormones and Vitellogenin, and Progeny Survival in the White Perch (Morone americana). Aquat. Toxicol.29(1-2): 1-19.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Yellow Perch	Fish	Fresh	Growth	NOEC	Whole Organism	A	51.5	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Yellow Perch	Fish	Fresh	Growth	NOEC	Whole Organism	A	50.9	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Yellow Perch	Fish	Fresh	Growth	NOEC	Whole Organism	A	51.5	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Yellow Perch	Fish	Fresh	Growth	NR	Not Reported	A	NR	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Yellow Perch	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	50.9	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Yellow Perch	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	50.9	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Yellow Perch	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	51.5	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
2,2',4,4',5,5'-Hexachloro-1,1'-biphenyl	Yellow Perch	Fish	Fresh	Mortality	NR-ZERO	Not Reported	A	51.5	NR	NR	ug/L	LAB	1999. Dabrowska, H., S.W. Fisher, K. Dabrowski, and A.E. Staubus. Dietary Uptake Efficiency of 2,2',4,4',5,5'-Hexachlorobiphenyl in Yellow Perch and Rainbow Trout: Role of Dietary and Body Lipids. Environ. Toxicol. Chem.18(5): 938-945.
1,1'-Biphenyl, Chloro derivs.	Zebra Danio	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	T	NR	NR	NR	ug/L	LAB	1998. Orn, S., P.L. Andersson, L. Forlin, M. Tysklind, and L. Norrgren. The Impact on Reproduction of an Orally Administered Mixture of Selected PCBs in Zebrafish (Danio rerio). Arch. Environ. Contam. Toxicol.35(1): 52-57.
1,1'-Biphenyl, Chloro derivs.	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Orn, S., P.L. Andersson, L. Forlin, M. Tysklind, and L. Norrgren. The Impact on Reproduction of an Orally Administered Mixture of Selected PCBs in Zebrafish (Danio rerio). Arch. Environ. Contam. Toxicol.35(1): 52-57.
2,3,4,4'-Tetrachlorobiphenyl	Zebra Danio	Fish	Fresh	Reproduction	NR	Not Reported	F	1	NR	NR	umol/kg	LAB	2000. Westerlund, L., K. Billsson, P.L. Andersson, M. Tysklind, and P.E. Olsson. Early Life-Stage Mortality in Zebrafish (Danio rerio) Following Maternal Exposure to Polychlorinated Biphenyls and Estrogen. Environ. Toxicol. Chem.19(6): 1582-1588.
2,3,3',4,4',5,6-Heptachloro-1,1'-biphenyl	Zebra Danio	Fish	Fresh	Reproduction	NR	Not Reported	F	1	NR	NR	umol/kg	LAB	2000. Westerlund, L., K. Billsson, P.L. Andersson, M. Tysklind, and P.E. Olsson. Early Life-Stage Mortality in Zebrafish (Danio rerio) Following Maternal Exposure to Polychlorinated Biphenyls and Estrogen. Environ. Toxicol. Chem.19(6): 1582-1588.
2,2',4,6,6'-Pentachloro-1,1'-biphenyl	Zebra Danio	Fish	Fresh	Reproduction	NR	Not Reported	F	1	NR	NR	umol/kg	LAB	2000. Westerlund, L., K. Billsson, P.L. Andersson, M. Tysklind, and P.E. Olsson. Early Life-Stage Mortality in Zebrafish (Danio rerio) Following Maternal Exposure to Polychlorinated Biphenyls and Estrogen. Environ. Toxicol. Chem.19(6): 1582-1588.

Table C-19. Summary of Results from the EcoTox Database for Fish - PCBs

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Zebra Danio	Fish	Fresh	Reproduction	NR	Not Reported	F	1	NR	NR	umol/kg	LAB	2000. Westerlund, L., K. Billsson, P.L. Andersson, M. Tysklind, and P.E. Olsson. Early Life-Stage Mortality in Zebrafish (Danio rerio) Following Maternal Exposure to Polychlorinated Biphenyls and Estrogen. Environ. Toxicol. Chem.19(6): 1582-1588.
2,2',3,4,5,6'-Hexachloro-1,1'-biphenyl	Zebra Danio	Fish	Fresh	Reproduction	NR	Not Reported	F	1	NR	NR	umol/kg	LAB	2000. Westerlund, L., K. Billsson, P.L. Andersson, M. Tysklind, and P.E. Olsson. Early Life-Stage Mortality in Zebrafish (Danio rerio) Following Maternal Exposure to Polychlorinated Biphenyls and Estrogen. Environ. Toxicol. Chem.19(6): 1582-1588.
2,2',3,3',4,5,6-Heptachloro-1,1'-biphenyl	Zebra Danio	Fish	Fresh	Reproduction	NR	Not Reported	F	1	NR	NR	umol/kg	LAB	2000. Westerlund, L., K. Billsson, P.L. Andersson, M. Tysklind, and P.E. Olsson. Early Life-Stage Mortality in Zebrafish (Danio rerio) Following Maternal Exposure to Polychlorinated Biphenyls and Estrogen. Environ. Toxicol. Chem.19(6): 1582-1588.
2,3,3',5,6-Pentachloro-1,1'-biphenyl	Zebra Danio	Fish	Fresh	Reproduction	NR	Not Reported	F	1	NR	NR	umol/kg	LAB	2000. Westerlund, L., K. Billsson, P.L. Andersson, M. Tysklind, and P.E. Olsson. Early Life-Stage Mortality in Zebrafish (Danio rerio) Following Maternal Exposure to Polychlorinated Biphenyls and Estrogen. Environ. Toxicol. Chem.19(6): 1582-1588.
2,2',3,4,4',6,6'-Heptachloro-1,1'-biphenyl	Zebra Danio	Fish	Fresh	Reproduction	NR	Not Reported	F	1	NR	NR	umol/kg	LAB	2000. Westerlund, L., K. Billsson, P.L. Andersson, M. Tysklind, and P.E. Olsson. Early Life-Stage Mortality in Zebrafish (Danio rerio) Following Maternal Exposure to Polychlorinated Biphenyls and Estrogen. Environ. Toxicol. Chem.19(6): 1582-1588.

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Table C-20. Summary of Results from the EcoTox Database for Fish - Selenium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Selenium	Bluegill	Fish	Fresh	Growth	NR	Not Reported	T	5100	NR	NR	ug/L	LAB	1996. Lemly, A.D.. Winter Stress Syndrome: An Important Consideration for Hazard Assessment of Aquatic Pollutants. Ecotoxicol. Environ. Saf.34: 223-227.
Selenium	Bluegill	Fish	Fresh	Growth	NR	Not Reported	T	7.9	NA	NR	ug/L	LAB	1993. Coyle, J.J., D.R. Buckler, C.G. Ingersoll, J.F. Fairchild, and T.W. May. Effect of Dietary Selenium on the Reproductive Success of Bluegills (Lepomis macrochirus). Environ. Toxicol. Chem.12: 551-565.
Selenium	Bluegill	Fish	Fresh	Growth	NR	Not Reported	T	2800	NA	NR	ug/L	LAB	1993. Cleveland, L., E.E. Little, D.R. Buckler, and R.H. Wiedmeyer. Toxicity and Bioaccumulation of Waterborne and Dietary Selenium in Juvenile Bluegill (Lepomis macrochirus). Aquat. Toxicol.27(3-4): 265-280.
Selenium	Bluegill	Fish	Fresh	Mortality	NOEC	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Cleveland, L., E.E. Little, D.R. Buckler, and R.H. Wiedmeyer. Toxicity and Bioaccumulation of Waterborne and Dietary Selenium in Juvenile Bluegill (Lepomis macrochirus). Aquat. Toxicol.27(3-4): 265-280.
Selenium	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	7.9	NA	NR	ug/L	LAB	1993. Coyle, J.J., D.R. Buckler, C.G. Ingersoll, J.F. Fairchild, and T.W. May. Effect of Dietary Selenium on the Reproductive Success of Bluegills (Lepomis macrochirus). Environ. Toxicol. Chem.12: 551-565.
Selenium	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	5100	NR	NR	ug/L	LAB	1996. Lemly, A.D.. Winter Stress Syndrome: An Important Consideration for Hazard Assessment of Aquatic Pollutants. Ecotoxicol. Environ. Saf.34: 223-227.
Selenium	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1985. Finley, K.A.. Observations of Bluegills Fed Selenium-Contaminated Hexagenia Nymphs Collected from Belews Lake, North Carolina. Bull. Environ. Contam. Toxicol.35(6): 816-825.
Selenium	Bluegill	Fish	Fresh	Reproduction	NR	Not Reported	T	7.9	NA	NR	ug/L	LAB	1993. Coyle, J.J., D.R. Buckler, C.G. Ingersoll, J.F. Fairchild, and T.W. May. Effect of Dietary Selenium on the Reproductive Success of Bluegills (Lepomis macrochirus). Environ. Toxicol. Chem.12: 551-565.
Selenium	Chinook Salmon	Fish	Fresh	Growth	NR		T	18200	NA	NR	ug/L	LAB	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer, and F.A. Bullard. Toxicity of Organic Selenium in the Diet to Chinook Salmon. Environ. Toxicol. Chem.9(3): 347-358.
Selenium	Chinook Salmon	Fish	Fresh	Growth	NR		T	9600	NA	NR	ug/L	LAB	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer, and F.A. Bullard. Toxicity of Organic Selenium in the Diet to Chinook Salmon. Environ. Toxicol. Chem.9(3): 347-358.
Selenium	Chinook Salmon	Fish	Fresh	Growth	NR		T	26000	NA	NR	ug/L	LAB	1986. Hamilton, S.J., A.N. Palmisano, G.A. Wedemeyer, and W.T. Yasutake. Impacts of Selenium on Early Life Stages and Smoltification of Fall Chinook Salmon. Trans. N. Am. Wildl. Nat. Resour. Conf.51: 343-356.
Selenium	Chinook Salmon	Fish	Fresh	Growth	NR		T	3200	NA	NR	ug/L	LAB	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer, and F.A. Bullard. Toxicity of Organic Selenium in the Diet to Chinook Salmon. Environ. Toxicol. Chem.9(3): 347-358.
Selenium	Chinook Salmon	Fish	Fresh	Growth	NR		T	5300	NA	NR	ug/L	LAB	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer, and F.A. Bullard. Toxicity of Organic Selenium in the Diet to Chinook Salmon. Environ. Toxicol. Chem.9(3): 347-358.
Selenium	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	46600	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Selenium	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	50900	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Selenium	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	67100	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Selenium	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	85500	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Selenium	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	35400	NA	NR	ug/L	LAB	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer, and F.A. Bullard. Toxicity of Organic Selenium in the Diet to Chinook Salmon. Environ. Toxicol. Chem.9(3): 347-358.
Selenium	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	5300	NA	NR	ug/L	LAB	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer, and F.A. Bullard. Toxicity of Organic Selenium in the Diet to Chinook Salmon. Environ. Toxicol. Chem.9(3): 347-358.
Selenium	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	9600	NA	NR	ug/L	LAB	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer, and F.A. Bullard. Toxicity of Organic Selenium in the Diet to Chinook Salmon. Environ. Toxicol. Chem.9(3): 347-358.
Selenium	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	16900	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Selenium	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	21800	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Selenium	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	24500	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Selenium	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	25800	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Acute Toxicity of Boron, Molybdenum, and Selenium to Fry of Chinook Salmon and Coho Salmon. Arch. Environ. Contam. Toxicol.19(3): 366-373.
Selenium	Fathead Minnow	Fish	Fresh	Growth	NR		T	NR	NA	NR	ug/L	LAB	1989. Ogle, R.S., and A.W. Knight. Effects of Elevated Foodborne Selenium on Growth and Reproduction of the Fathead Minnow (Pimephales promelas). Arch. Environ. Contam. Toxicol.18(6): 795-803.
Selenium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1980. Halter, M.T., W.J. Adams, and H.E. Johnson. Selenium Toxicity to Daphnia magna, Hyallela azteca, and the Fathead Minnow in Hard Water. Bull. Environ. Contam. Toxicol.24(1): 102-107.

Table C-20. Summary of Results from the EcoTox Database for Fish - Selenium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Selenium	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NA	NR	ug/L	LAB	1980. Halter, M.T., W.J. Adams, and H.E. Johnson. Selenium Toxicity to Daphnia magna, Hyallela azteca, and the Fathead Minnow in Hard Water. Bull. Environ. Contam. Toxicol.24(1): 102-107.
Selenium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	40000	NA	NR	ug/L	LAB	1980. Halter, M.T., W.J. Adams, and H.E. Johnson. Selenium Toxicity to Daphnia magna, Hyallela azteca, and the Fathead Minnow in Hard Water. Bull. Environ. Contam. Toxicol.24(1): 102-107.
Selenium	Grass Carp, White Amur	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	25	NA	NR	ug/L	FIELDA	1992. Crane, M., T. Flower, D. Holmes, and S. Watson. The Toxicity of Selenium in Experimental Freshwater Ponds. Arch. Environ. Contam. Toxicol.23(4): 440-452.
Selenium	Perch Family	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDA	1992. Crane, M., T. Flower, D. Holmes, and S. Watson. The Toxicity of Selenium in Experimental Freshwater Ponds. Arch. Environ. Contam. Toxicol.23(4): 440-452.
Selenium	Perch Family	Fish	Fresh	Mortality	NR	Not Reported	T	25	NA	NR	ug/L	LAB	1992. Crane, M., T. Flower, D. Holmes, and S. Watson. The Toxicity of Selenium in Experimental Freshwater Ponds. Arch. Environ. Contam. Toxicol.23(4): 440-452.
Selenium	Perch Family	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Crane, M., T. Flower, D. Holmes, and S. Watson. The Toxicity of Selenium in Experimental Freshwater Ponds. Arch. Environ. Contam. Toxicol.23(4): 440-452.
Selenium	Perch Family	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1992. Crane, M., T. Flower, D. Holmes, and S. Watson. The Toxicity of Selenium in Experimental Freshwater Ponds. Arch. Environ. Contam. Toxicol.23(4): 440-452.
Selenium	Perch Family	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDA	1992. Crane, M., T. Flower, D. Holmes, and S. Watson. The Toxicity of Selenium in Experimental Freshwater Ponds. Arch. Environ. Contam. Toxicol.23(4): 440-452.
Selenium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Selenium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Selenium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	12500	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Selenium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11500	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Selenium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	3100	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Selenium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	80	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Selenium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	7800	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Selenium	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	10400	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Selenium	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Selenium	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	40	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Selenium	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	40	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Selenium	Striped Bass	Fish	Fresh	Growth	NR		T	9600	NA	NR	ug/L	LAB	1989. Coughlan, D.J., and J.S. Velte. Dietary Toxicity of Selenium-Contaminated Red Shiners to Striped Bass. Trans. Am. Fish. Soc.118(4): 400-408.
Selenium	Zambezi Barbel	Fish	Fresh	Growth	NOEC	Whole Organism	T	500000	NR	NR	ug/L	LAB	2007. Abdel-Tawwab, M., M.A.A. Mousa, and F.E. Abbass. Growth Performance and Physiological Response of African Catfish, Clarias gariepinus (B.) Fed Organic Selenium Prior to the Exposure to Environmental Copper Toxicity. Aquaculture272(1-4): 335-345.
Selenium	Zambezi Barbel	Fish	Fresh	Growth	NOEC	Whole Organism	T	500000	NR	NR	ug/L	LAB	2007. Abdel-Tawwab, M., M.A.A. Mousa, and F.E. Abbass. Growth Performance and Physiological Response of African Catfish, Clarias gariepinus (B.) Fed Organic Selenium Prior to the Exposure to Environmental Copper Toxicity. Aquaculture272(1-4): 335-345.
Selenium	Zambezi Barbel	Fish	Fresh	Mortality	NOEC	Not Reported	T	500000	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

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Table C-21. Summary of Results from the EcoTox Database for Fish - Silica

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Silicic acid, Sodium salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1956. Department of Scientific and Industrial Research. Water Pollution Research 1955. Rep.of the Water Pollut.Res.Board, Water Pollut.Res.Lab., H.M.Stationary Office, London: 81 p..
Silicic acid, Sodium salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	256000	NR	NR	ug/L	LAB	1956. Department of Scientific and Industrial Research. Water Pollution Research 1955. Rep.of the Water Pollut.Res.Board, Water Pollut.Res.Lab., H.M.Stationary Office, London: 81 p..
Silicic acid, Sodium salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	256000	NR	NR	ug/L	LAB	1953. Department of Scientific and Industrial Research. Water Pollution Research 1952. Rep.of the Water Pollut.Res.Board, Water Pollut.Res.Lab., H.M.Stationary Office, London: 83 p..
Silicic acid, Sodium salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	3200000	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Silicic acid, Sodium salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	2400000	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Silicic acid, Sodium salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	1800000	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.
Silicic acid, Sodium salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	2320000	NA	NR	ug/L	LAB	1957. Wallen, I.E., W.C. Greer, and R. Lasater. Toxicity to Gambusia affinis of Certain Pure Chemicals in Turbid Waters. Sewage Ind. Wastes29(6): 695-711.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	11.1	NA	NR	ug/L	LAB	1979. Nishiuchi, Y.. Toxicity of Pesticides to Animals in Freshwater. LXII. Suisan Zoshoku27(2): 119-124.
Nitric acid, silver (1+) salt	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	6.7	NA	NR	ug/L	LAB	1979. Nishiuchi, Y.. Toxicity of Pesticides to Animals in Freshwater. LXII. Suisan Zoshoku27(2): 119-124.
Nitric acid, silver (1+) salt	Bluegill	Fish	Fresh	Growth	NR		T	70	NA	NR	ug/L	LAB	1974. Coleman, R.L., and J.E. Cearley. Silver Toxicity and Accumulation in Largemouth Bass and Bluegill. Bull. Environ. Contam. Toxicol.12(1): 53-61.
Silver	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	F	64	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Nitric acid, silver (1+) salt	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	800	NR	NR	ug/L	LAB	1981. Buccafusco, R.J., S.J. Ells, and G.A. LeBlanc. Acute Toxicity of Priority Pollutants to Bluegill (Lepomis macrochirus). Bull. Environ. Contam. Toxicol.26(4): 446-452.
Nitric acid, silver (1+) salt	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	13	NA	NR	ug/L	LAB	1987. Holcombe, G.W., G.L. Phipps, A.H. Sulaiman, and A.D. Hoffman. Simultaneous Multiple Species Testing: Acute Toxicity of 13 Chemicals to 12 Diverse Freshwater Amphibian, Fish, and Invertebrate Families. Arch. Environ. Contam. Toxicol.16: 697-710.
Nitric acid, silver (1+) salt	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	31.7	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	60	NR	NR	ug/L	LAB	1981. Buccafusco, R.J., S.J. Ells, and G.A. LeBlanc. Acute Toxicity of Priority Pollutants to Bluegill (Lepomis macrochirus). Bull. Environ. Contam. Toxicol.26(4): 446-452.
Nitric acid, silver (1+) salt	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	18.4	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	17.3	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Birge, W.J., and J.A. Zuiderveen. The Comparative Toxicity of Silver to Aquatic Biota. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 79-87.
Silver chloride	Chinook Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Nitric acid, silver (1+) salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	11.1	NA	NR	ug/L	LAB	1979. Nishiuchi, Y.. Toxicity of Pesticides to Animals in Freshwater. LXII. Suisan Zoshoku27(2): 119-124.
Nitric acid, silver (1+) salt	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	12.5	NA	NR	ug/L	LAB	1979. Nishiuchi, Y.. Toxicity of Pesticides to Animals in Freshwater. LXII. Suisan Zoshoku27(2): 119-124.
Nitric acid, silver (1+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	4.3*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Nitric acid, silver (1+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3.4*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Nitric acid, silver (1+) salt	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2.7*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Nitric acid, silver (1+) salt	Common Carp	Fish	Fresh	Mortality	LD50	Not Reported	T	0.1	NR	NR	mg/h	LAB	1982. Ding, S., F. Zhou, Z. Kong, L. Kong, B. Wang, and L. Wang. Acute Toxicity of Silver to Carp (Cyprinus carpio) and Goldfish (Carassius auratus) and Its Accumulation and Distribution in Fish Bodies. Huanjing Kexue3(4): 6-9.
Nitric acid, silver (1+) salt	Common Carp	Fish	Fresh	Mortality	LD50	Not Reported	T	0.08	NR	NR	mg/h	LAB	1982. Ding, S., F. Zhou, Z. Kong, L. Kong, B. Wang, and L. Wang. Acute Toxicity of Silver to Carp (Cyprinus carpio) and Goldfish (Carassius auratus) and Its Accumulation and Distribution in Fish Bodies. Huanjing Kexue3(4): 6-9.
Nitric acid, silver (1+) salt	Common Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	34.4	NR	NR	ug/L	LAB	2000. Grosell, M., C. Hogstrand, C.M. Wood, and H.J.M. Hansen. A Nose-to-Nose Comparison of the Physiological Effects of Exposure to Ionic Silver Versus Silver Chloride in the European Eel (Anguilla anguilla) and the Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.48(2-3): 327-342.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	IC20	Whole Organism	D	0.45		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	IC20	Whole Organism	D	0.3		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	IC20	Whole Organism	D	0.96		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	IC20	Whole Organism	D	0.32		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	IC20	Whole Organism	D	0.94		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	D	0.795		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	1		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	1.5		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	1.5		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	1.41	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	D	0.53		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	D	0.36		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	D	0.83		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	D	0.83		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	1.22		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	1.01	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	D	0.351		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	0.5		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	0.75		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	D	0.606		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	2		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	0.75		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	0.729	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	1.8	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	1.07	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	F	36.25	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.13	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.38	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.76	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.12	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.42	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.7	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.25	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.28	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.42	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.91	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.05	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.05	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.13	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.5	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.94	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.1	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.38	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Silver	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.88	NR	NR	ug/L	LAB	1996. Klaine, S.J., T.W. La Point, G.P. Cobb, B.L. Forsythe II, T.P. Bills, M.D. Wenholz, and R.D. Jeffers. Influence of Water Quality Parameters on Silver Toxicity: Preliminary Result. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 65-77.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13.4		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13.7		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14.3		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.3		NC	ug/L	LAB	2008. Bielmyer, G.K., K.V. Brix, and M. Grosell. Is Cl- Protection Against Silver Toxicity Due to Chemical Speciation?. Aquat. Toxicol.87(2): 81-87.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21.4		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	22.5		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	23.3		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.8		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	32.9		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.2		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.6		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.2		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.9		NC	ug/L	LAB	2003. VanGenderen, E.J., A.C. Ryan, J.R. Tomasso, and S.J. Klaine. Influence of Dissolved Organic Matter Source on Silver Toxicity to Pimephales promelas. Environ. Toxicol. Chem.22(11): 2746-2751.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	18.3		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	24.5		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	29.1		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	30		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	31		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	36		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	36.6		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	37.2		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	41.3		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	42.6		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	45.6		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	46.4		NC	ug/L	LAB	1984. Birge, W.J., J.A. Black, J.F. Hobson, A.G. Westerman, and T.M. Short. Toxicological Studies on Aquatic Contaminants Originating from Coal Production and Utilization: The Induction of Tolerance to Silver in Laboratory Populations of Fish and the Chronic Toxicity of Nickel to Fish Early Lif. Proj.No.G-844-02, Water Resources Research Institute Research Rep.No.151, University of Kentucky, Lexington, KY: 36 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	20.7	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13.6	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	17.3	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12.9	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15.2	NA	NR	ug/L	LAB	1982. Lima, A.R., C. Curtis, D.E. Hammermeister, D.J. Call, and T.A. Felhaber. Acute Toxicity of Silver to Selected Fish and Invertebrates. Bull. Environ. Contam. Toxicol.29(2): 184-189.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.6	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14.4	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.8	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11.6	NA	NR	ug/L	LAB	1982. Lima, A.R., C. Curtis, D.E. Hammermeister, D.J. Call, and T.A. Felhaber. Acute Toxicity of Silver to Selected Fish and Invertebrates. Bull. Environ. Contam. Toxicol.29(2): 184-189.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.5	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.7	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.8	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.8	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.7	NA	NR	ug/L	LAB	1982. Lima, A.R., C. Curtis, D.E. Hammermeister, D.J. Call, and T.A. Felhaber. Acute Toxicity of Silver to Selected Fish and Invertebrates. Bull. Environ. Contam. Toxicol.29(2): 184-189.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.2	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.1	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.8	NA	NR	ug/L	LAB	1998. Erickson, R.J., L.T. Brooke, M.D. Kahl, F.V. Venter, S.L. Harting, T.P. Markee, and R.L. Spehar. Effects of Laboratory Test Conditions on the Toxicity of Silver to Aquatic Organisms. Environ. Toxicol. Chem.17(4): 572-578.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.9	NR	NR	ug/L	LAB	1993. Brooke, L.T.. The Effects of Food and Test Solution Age on the Toxicity of Silver to Three Freshwater Organisms. Contract No.68-C1-0034, Work Assignment No.1-10, Environ.Health Lab, Univ.of Wisconsin-Superior, Superior, WI: 19 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Erickson, R.J., L.T. Brooke, M.D. Kahl, F.V. Venter, S.L. Harting, T.P. Markee, and R.L. Spehar. Effects of Laboratory Test Conditions on the Toxicity of Silver to Aquatic Organisms. Environ. Toxicol. Chem.17(4): 572-578.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Erickson, R.J., L.T. Brooke, M.D. Kahl, F.V. Venter, S.L. Harting, T.P. Markee, and R.L. Spehar. Effects of Laboratory Test Conditions on the Toxicity of Silver to Aquatic Organisms. Environ. Toxicol. Chem.17(4): 572-578.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.7	NA	NR	ug/L	LAB	1982. Lima, A.R., C. Curtis, D.E. Hammermeister, D.J. Call, and T.A. Felhaber. Acute Toxicity of Silver to Selected Fish and Invertebrates. Bull. Environ. Contam. Toxicol.29(2): 184-189.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.98	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11.1	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11.75	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.9	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.3	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.6	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.78	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.3	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.7	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.4	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9	NA	NR	ug/L	LAB	1987. Holcombe, G.W., G.L. Phipps, A.H. Sulaiman, and A.D. Hoffman. Simultaneous Multiple Species Testing: Acute Toxicity of 13 Chemicals to 12 Diverse Freshwater Amphibian, Fish, and Invertebrate Families. Arch. Environ. Contam. Toxicol.16: 697-710.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16	NA	NR	ug/L	LAB	1984. LeBlanc, G.A., J.D. Mastone, A.P. Paradice, and B.F. Wilson. The Influence of Speciation on the Toxicity of Silver to Fathead Minnow (Pimephales promelas). Environ. Toxicol. Chem.3(1): 37-46.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	16	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.9	NA	NR	ug/L	LAB	1978. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-13, DNR, Boulder, CO: 46.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.8	NA	NR	ug/L	LAB	1978. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-13, DNR, Boulder, CO: 46.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.2	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13.3	D	6.2	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	18	D	0.4	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.7	D	4.9	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.5	D	4.1	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.7	D	2.3	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.8	D	6.1	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.8	D	1.7	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.9	D	8.4	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.4	NA	NR	ug/L	LAB	1998. Erickson, R.J., L.T. Brooke, M.D. Kahl, F.V. Venter, S.L. Harting, T.P. Markee, and R.L. Spehar. Effects of Laboratory Test Conditions on the Toxicity of Silver to Aquatic Organisms. Environ. Toxicol. Chem.17(4): 572-578.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	106	NA	NR	ug/L	LAB	1998. Erickson, R.J., L.T. Brooke, M.D. Kahl, F.V. Venter, S.L. Harting, T.P. Markee, and R.L. Spehar. Effects of Laboratory Test Conditions on the Toxicity of Silver to Aquatic Organisms. Environ. Toxicol. Chem.17(4): 572-578.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Erickson, R.J., L.T. Brooke, M.D. Kahl, F.V. Venter, S.L. Harting, T.P. Markee, and R.L. Spehar. Effects of Laboratory Test Conditions on the Toxicity of Silver to Aquatic Organisms. Environ. Toxicol. Chem.17(4): 572-578.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11.6	NA	NR	ug/L	LAB	1997. Rodgers, J.H.J., E. Deaver, B.C. Suedel, and P.L. Rogers. Comparative Aqueous Toxicity of Silver Compounds: Laboratory Studies with Freshwater Species. Bull. Environ. Contam. Toxicol.58: 851-858.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.3	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12.3	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12.4	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13.8	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19.6	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	22.66	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	230	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	30.43	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.7	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.7	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.4	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.74	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.4	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.97	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.19	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10.2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11.18	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11.2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12.28	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12.3	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13.35	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13.4	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.06	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.1	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.24	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.24	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.3	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.34	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.43	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.43	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.67	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.7	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.75	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.79	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.79	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21.1	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	21.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	23.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	24	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	24.3	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	26	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	26.2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	26.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	29.2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.19	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.56	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.6	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	33.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.19	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.23	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.3	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.32	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.4	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.41	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.39	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.39	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.47	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.5	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.6	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.6	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.63	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5.63	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.05	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.08	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.83	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6.83	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.39	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.4	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.4	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.44	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.46	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.46	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.5	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.7	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.7	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.89	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.9	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.98	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.06	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.1	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.7	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.72	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.79	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.79	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	9.82	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19.6	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8.2	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2100	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	510	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5400	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2100	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	510	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5600	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2100	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	510	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5600	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2100	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	510	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5600	NR	NR	ug/L	LAB	1979. EG&G Bionomics. The Acute Toxicity of Various Silver Compounds to the Fathead Minnow (Pimephales promelas). EG&G Bionomics, Rep.#BW-79-12-576, Natl.Assoc.Photo.Manufacturers, Inc., Harrison, NY.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	1		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	D	0.795		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	3		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	2		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	30	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	9.5	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.5		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	D	0.351		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.5		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	D	0.606		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	1		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	3		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.1	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.9	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	2.1	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	2.1	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	2.1	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	2.3	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	2.3	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	2.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	2.6	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	2.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	3.4	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	3.7	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	3.9	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	4.2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	4.6	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	4.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	4.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	4.9	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	5.1	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	5.7	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	5.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	5.9	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	6.4	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	6.4	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	6.6	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	6.6	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	6.6	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	6.8	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	6.9	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.1	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.2	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.4	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.6	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.7	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.7	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.7	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.9	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	9.4	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	9.6	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.7	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	5	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	7.9	NR	NR	ug/L	LAB	1996. Forsythe II, B.L.. Silver in a Freshwater Ecosystem: Acute Toxicity and Trophic Transfer. Ph.D.Thesis, Clemson Univ., Clemson, SC: 149 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	4.9	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1978. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-13, DNR, Boulder, CO: 46.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	0.37	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	0.65	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	1.07	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. LeBlanc, G.A., J.D. Mastone, A.P. Paradice, and B.F. Wilson. The Influence of Speciation on the Toxicity of Silver to Fathead Minnow (Pimephales promelas). Environ. Toxicol. Chem.3(1): 37-46.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3.29	NA	NR	ug/L	LAB	1983. Holcombe, G.W., G.L. Phipps, and J.T. Fiandt. Toxicity of Selected Priority Pollutants to Various Aquatic Organisms. Ecotoxicol. Environ. Saf.7(4): 400-409.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.19		NC	ug/L	LAB	2007. Naddy, R.B., A.B. Rehner, G.R. McNerney, J.W. Gorsuch, J.R. Kramer, C.M. Wood, P.R. Paquin, and W.A. Stubblefield. Comparison of Short-Term Chronic and Chronic Silver Toxicity to Fathead Minnows in Unamended and Sodium Chloride-Amended Waters. Environ. Toxicol. Chem.26(9): 1922-1930.
Nitric acid, silver (1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.729	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Silver chloride	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	380	NA	NR	ug/L	LAB	1984. LeBlanc, G.A., J.D. Mastone, A.P. Paradice, and B.F. Wilson. The Influence of Speciation on the Toxicity of Silver to Fathead Minnow (Pimephales promelas). Environ. Toxicol. Chem.3(1): 37-46.
Nitric acid, silver (1+) salt	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	43.7	NA	NR	ug/L	LAB	1982. Lima, A.R., C. Curtis, D.E. Hammermeister, D.J. Call, and T.A. Felhaber. Acute Toxicity of Silver to Selected Fish and Invertebrates. Bull. Environ. Contam. Toxicol.29(2): 184-189.
Nitric acid, silver (1+) salt	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	25.9	NA	NR	ug/L	LAB	1982. Lima, A.R., C. Curtis, D.E. Hammermeister, D.J. Call, and T.A. Felhaber. Acute Toxicity of Silver to Selected Fish and Invertebrates. Bull. Environ. Contam. Toxicol.29(2): 184-189.
Nitric acid, silver (1+) salt	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	15.8	NA	NR	ug/L	LAB	1982. Lima, A.R., C. Curtis, D.E. Hammermeister, D.J. Call, and T.A. Felhaber. Acute Toxicity of Silver to Selected Fish and Invertebrates. Bull. Environ. Contam. Toxicol.29(2): 184-189.
Nitric acid, silver (1+) salt	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	9.2	NA	NR	ug/L	LAB	1982. Lima, A.R., C. Curtis, D.E. Hammermeister, D.J. Call, and T.A. Felhaber. Acute Toxicity of Silver to Selected Fish and Invertebrates. Bull. Environ. Contam. Toxicol.29(2): 184-189.
Silver	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Nitric acid, silver (1+) salt	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	20	NR	NR	ug/L	LAB	1996. Birge, W.J., and J.A. Zuiderveen. The Comparative Toxicity of Silver to Aquatic Biota. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 79-87.
Nitric acid, silver (1+) salt	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Nitric acid, silver (1+) salt	Goldfish	Fish	Fresh	Mortality	LD50	Not Reported	T	0.089	NR	NR	mg/h	LAB	1982. Ding, S., F. Zhou, Z. Kong, L. Kong, B. Wang, and L. Wang. Acute Toxicity of Silver to Carp (Cyprinus carpio) and Goldfish (Carassius auratus) and Its Accumulation and Distribution in Fish Bodies. Huanjing Kexue3(4): 6-9.
Nitric acid, silver (1+) salt	Goldfish	Fish	Fresh	Mortality	LD50	Not Reported	T	0.049	NR	NR	mg/h	LAB	1982. Ding, S., F. Zhou, Z. Kong, L. Kong, B. Wang, and L. Wang. Acute Toxicity of Silver to Carp (Cyprinus carpio) and Goldfish (Carassius auratus) and Its Accumulation and Distribution in Fish Bodies. Huanjing Kexue3(4): 6-9.
Nitric acid, silver (1+) salt	Goldfish	Fish	Fresh	Mortality	LD50	Not Reported	T	0.21	NR	NR	mg/h	LAB	1982. Ding, S., F. Zhou, Z. Kong, L. Kong, B. Wang, and L. Wang. Acute Toxicity of Silver to Carp (Cyprinus carpio) and Goldfish (Carassius auratus) and Its Accumulation and Distribution in Fish Bodies. Huanjing Kexue3(4): 6-9.
Nitric acid, silver (1+) salt	Goldfish	Fish	Fresh	Mortality	LD50	Not Reported	T	0.047	NR	NR	mg/h	LAB	1982. Ding, S., F. Zhou, Z. Kong, L. Kong, B. Wang, and L. Wang. Acute Toxicity of Silver to Carp (Cyprinus carpio) and Goldfish (Carassius auratus) and Its Accumulation and Distribution in Fish Bodies. Huanjing Kexue3(4): 6-9.
Nitric acid, silver (1+) salt	Goldfish	Fish	Fresh	Mortality	LD50	Not Reported	T	0.153	NR	NR	mg/h	LAB	1982. Ding, S., F. Zhou, Z. Kong, L. Kong, B. Wang, and L. Wang. Acute Toxicity of Silver to Carp (Cyprinus carpio) and Goldfish (Carassius auratus) and Its Accumulation and Distribution in Fish Bodies. Huanjing Kexue3(4): 6-9.
Nitric acid, silver (1+) salt	Goldfish	Fish	Fresh	Mortality	LD50	Not Reported	T	0.044	NR	NR	mg/h	LAB	1982. Ding, S., F. Zhou, Z. Kong, L. Kong, B. Wang, and L. Wang. Acute Toxicity of Silver to Carp (Cyprinus carpio) and Goldfish (Carassius auratus) and Its Accumulation and Distribution in Fish Bodies. Huanjing Kexue3(4): 6-9.
Nitric acid, silver (1+) salt	Goldfish	Fish	Fresh	Mortality	LD50	Not Reported	T	0.091	NR	NR	mg/h	LAB	1982. Ding, S., F. Zhou, Z. Kong, L. Kong, B. Wang, and L. Wang. Acute Toxicity of Silver to Carp (Cyprinus carpio) and Goldfish (Carassius auratus) and Its Accumulation and Distribution in Fish Bodies. Huanjing Kexue3(4): 6-9.
Silver chloride	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	15	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Silver Chloride to a Fresh Water Fish Lepidocephalichthyes guntea. Environ. Ecol.6(3): 713-716.
Silver chloride	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Silver Chloride to a Fresh Water Fish Lepidocephalichthyes guntea. Environ. Ecol.6(3): 713-716.
Silver chloride	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	7.8	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Silver Chloride to a Fresh Water Fish Lepidocephalichthyes guntea. Environ. Ecol.6(3): 713-716.
Silver chloride	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	5.3	NA	NR	ug/L	LAB	1988. Shivaraj, K.M., and H.S. Patil. Toxicity of Silver Chloride to a Fresh Water Fish Lepidocephalichthyes guntea. Environ. Ecol.6(3): 713-716.
Nitric acid, silver (1+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	57.16	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	41.4	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	16.03	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	14.34	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	6.44	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	1996. Birge, W.J., and J.A. Zuiderveen. The Comparative Toxicity of Silver to Aquatic Biota. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 79-87.
Nitric acid, silver (1+) salt	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Nitric acid, silver (1+) salt	Largemouth Bass	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	70	NA	NR	ug/L	LAB	1974. Coleman, R.L., and J.E. Cearley. Silver Toxicity and Accumulation in Largemouth Bass and Bluegill. Bull. Environ. Contam. Toxicol.12(1): 53-61.
Nitric acid, silver (1+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, silver (1+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, silver (1+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	50000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, silver (1+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	140	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, silver (1+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, silver (1+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	25000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Nitric acid, silver (1+) salt	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Hiraoka, Y., S. Ishizawa, T. Kamada, and H. Okuda. Acute Toxicity of 14 Different Kinds of Metals Affecting Medaka Fry. Hiroshima J. Med. Sci.34(3): 327-330.
Nitric acid, silver (1+) salt	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	13.6	NA	NR	ug/L	LAB	1978. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-13, DNR, Boulder, CO: 46.
Nitric acid, silver (1+) salt	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	5.3	NA	NR	ug/L	LAB	1978. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-13, DNR, Boulder, CO: 46.
Nitric acid, silver (1+) salt	Mottled Sculpin	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1978. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-13, DNR, Boulder, CO: 46.
Nitric acid, silver (1+) salt	Mummichog	Fish	Fresh	Mortality	LC50	Not Reported	T	3.8		NC	ug/L	LAB	2008. Bielmyer, G.K., K.V. Brix, and M. Grosell. Is Cl- Protection Against Silver Toxicity Due to Chemical Speciation?. Aquat. Toxicol.87(2): 81-87.
Nitric acid, silver (1+) salt	Nile Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.
Nitric acid, silver (1+) salt	Nile Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.
Nitric acid, silver (1+) salt	Nile Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.
Nitric acid, silver (1+) salt	Nile Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	50		NC	ug/L	LAB	2008. Oner, M., G. Atli, and M. Canli. Changes in Serum Biochemical Parameters of Freshwater Fish Oreochromis niloticus Following Prolonged Metal (Ag, Cd, Cr, Cu, Zn) Exposures. Environ. Toxicol. Chem.27(2): 360-366.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	0.69	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	0.6	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	LOEL	Whole Organism	T	10.7		NC	ug/L	LAB	2002. Brauner, C.J., and C.M. Wood. Effect of Long-Term Silver Exposure on Survival and Ionoregulatory Development in Rainbow Trout (Oncorhynchus mykiss) Embryos and Larvae, in the Presence and Absence of Added Dissolved Organic Matter. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.133(1-2): 161-173.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	LOEL	Whole Organism	T	0.098		NC	ug/L	LAB	2002. Brauner, C.J., and C.M. Wood. Ionoregulatory Development and the Effect of Chronic Silver Exposure on Growth, Survival, and Sublethal Indicators of Toxicity in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(2): 153-162.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	LOEL	Whole Organism	T	4.81		NC	ug/L	LAB	2002. Galvez, F., and C.M. Wood. The Mechanisms and Costs of Physiological and Toxicological Acclimation to Waterborne Silver in Juvenile Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(7): 587-597.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	LOEL	Whole Organism	T	0.75		NC	ug/L	LAB	2007. Dethloff, G.M., R.B. Naddy, and J.W. Gorsuch. Effects of Sodium Chloride on Chronic Silver Toxicity to Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.26(8): 1717-1725.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	0.34	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEL	Not Reported	T	1.04		NC	ug/L	LAB	2002. Galvez, F., and C.M. Wood. The Mechanisms and Costs of Physiological and Toxicological Acclimation to Waterborne Silver in Juvenile Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(7): 587-597.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEL	Whole Organism	T	3.02		NC	ug/L	LAB	2002. Galvez, F., and C.M. Wood. The Mechanisms and Costs of Physiological and Toxicological Acclimation to Waterborne Silver in Juvenile Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(7): 587-597.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEL	Whole Organism	T	3.2		NC	nM	LAB	1999. Ferguson, E.A.. Biochemistry and Physiology of Silver Toxicity to Rainbow Trout: Effects on Ionoregulation, Smoltification, and Seawater Survival. Ph.D.Thesis, Univ.of Kentucky: 149 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEL	Whole Organism	T	1.64		NC	ug/L	LAB	2007. Dethloff, G.M., R.B. Naddy, and J.W. Gorsuch. Effects of Sodium Chloride on Chronic Silver Toxicity to Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.26(8): 1717-1725.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	NOEL	Whole Organism	T	0.38		NC	ug/L	LAB	2007. Dethloff, G.M., R.B. Naddy, and J.W. Gorsuch. Effects of Sodium Chloride on Chronic Silver Toxicity to Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.26(8): 1717-1725.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Galvez, F., C. Hogstrand, and C.M. Wood. Physiological Responses of Juvenile Rainbow Trout to Chronic Low Level Exposure of Waterborne Silver. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.119(2): 131-137.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	0.34	NA	NR	ug/L	LAB	1978. Davies, P.H., J.P.,Jr. Goettl, and J.R. Sinley. Toxicity of Silver to Rainbow Trout (Salmo gairdneri). Water Res.12(2): 113-117.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Growth	NR		T	0.69	NA	NR	ug/L	LAB	1978. Davies, P.H., J.P.,Jr. Goettl, and J.R. Sinley. Toxicity of Silver to Rainbow Trout (Salmo gairdneri). Water Res.12(2): 113-117.
Silver	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Silver	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Silver	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6.2	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Silver	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8.1	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Silver	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Silver	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6.2	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Silver	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8.2	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Silver	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	51.4	NR	NR	ug/L	LAB	2000. Office of Pesticide Programs. Pesticide Ecotoxicity Database (Formerly: Environmental Effects Database (EEDB)). Environmental Fate and Effects Division, U.S.EPA, Washington, D.C..
Silver	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.3	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15.1		NC	ug/L	LAB	2002. Galvez, F., and C.M. Wood. The Mechanisms and Costs of Physiological and Toxicological Acclimation to Waterborne Silver in Juvenile Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(7): 587-597.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7.6		NC	ug/L	LAB	2002. Galvez, F., and C.M. Wood. The Mechanisms and Costs of Physiological and Toxicological Acclimation to Waterborne Silver in Juvenile Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(7): 587-597.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2002. Galvez, F., and C.M. Wood. The Mechanisms and Costs of Physiological and Toxicological Acclimation to Waterborne Silver in Juvenile Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(7): 587-597.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2002. Galvez, F., and C.M. Wood. The Mechanisms and Costs of Physiological and Toxicological Acclimation to Waterborne Silver in Juvenile Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(7): 587-597.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13.3		NC	ug/L	LAB	2004. Morgan, T.P., and C.M. Wood. A Relationship Between Gill Silver Accumulation and Acute Silver Toxicity in the Freshwater Rainbow Trout: Support for the Acute Silver Biotic Ligand Model. Environ. Toxicol. Chem.23(5): 1261-1267.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	136		NC	nM	LAB	2004. Mann, R.M., M.J. Ernste, R.A. Bell, J.R. Kramer, and C.M. Wood. Evaluation of the Protective Effects of Reactive Sulfide on the Acute Toxicity of Silver to Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.23(5): 1204-1210.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	22.4		NC	ug/L	LAB	2002. Galvez, F., and C.M. Wood. The Mechanisms and Costs of Physiological and Toxicological Acclimation to Waterborne Silver in Juvenile Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(7): 587-597.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9.9		NC	ug/L	LAB	2002. Galvez, F., and C.M. Wood. The Mechanisms and Costs of Physiological and Toxicological Acclimation to Waterborne Silver in Juvenile Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(7): 587-597.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2002. Galvez, F., and C.M. Wood. The Mechanisms and Costs of Physiological and Toxicological Acclimation to Waterborne Silver in Juvenile Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(7): 587-597.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9.1		NC	ug/L	LAB	1997. Wood, C.M., S. Munger, and C. Hogstrand. The Physiological Mechanisms of Toxicity of Silver and Other Metals to Freshwater Fish. In: A.W.Andren and T.W.Bober (Eds.), 1st Int.Conf Proc.on Transport, Fate and Effects of Silver in the Environment, Aug.8-10, 1993, University of Wisconsin-Madison, Madison, WI: 89-92.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10.2	NR	NR	ug/L	LAB	2000. Grosell, M., C. Hogstrand, C.M. Wood, and H.J.M. Hansen. A Nose-to-Nose Comparison of the Physiological Effects of Exposure to Ionic Silver Versus Silver Chloride in the European Eel (Anguilla anguilla) and the Rainbow Trout (Oncorhynchus mykiss). Aquat. Toxicol.48(2-3): 327-342.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	28.8	NR	NR	ug/L	LAB	1977. Hale, J.G.. Toxicity of Metal Mining Wastes. Bull. Environ. Contam. Toxicol.17(1): 66-73.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11.5	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	12	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13	NA	NR	ug/L	LAB	1978. Davies, P.H., J.P.,Jr. Goettl, and J.R. Sinley. Toxicity of Silver to Rainbow Trout (Salmo gairdneri). Water Res.12(2): 113-117.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	17.87	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.3	NA	NR	ug/L	LAB	1978. Davies, P.H., J.P.,Jr. Goettl, and J.R. Sinley. Toxicity of Silver to Rainbow Trout (Salmo gairdneri). Water Res.12(2): 113-117.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6	NA	NR	ug/L	LAB	1987. Holcombe, G.W., G.L. Phipps, A.H. Sulaiman, and A.D. Hoffman. Simultaneous Multiple Species Testing: Acute Toxicity of 13 Chemicals to 12 Diverse Freshwater Amphibian, Fish, and Invertebrate Families. Arch. Environ. Contam. Toxicol.16: 697-710.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6.2	NA	NR	ug/L	LAB	1978. Davies, P.H., J.P.,Jr. Goettl, and J.R. Sinley. Toxicity of Silver to Rainbow Trout (Salmo gairdneri). Water Res.12(2): 113-117.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6.9	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8.1	NA	NR	ug/L	LAB	1978. Davies, P.H., J.P.,Jr. Goettl, and J.R. Sinley. Toxicity of Silver to Rainbow Trout (Salmo gairdneri). Water Res.12(2): 113-117.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8.4	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8.5	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8.6	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9.2	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9.7	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9.72	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1.48	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	17.07	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.421	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	28.42	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3.39	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3.579	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3.764	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5.571	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9.462	NR	NR	ug/L	LAB	1999. Karen, D.J., D.R. Ownby, B.L. Forsythe, T.P. Bills, T.W. LaPoint, G.B. Cobb, and S.J. Klaine. Influence of Water Quality on Silver Toxicity to Rainbow Trout (Oncorhynchus mykiss), Fathead Minnows (Pimephales promelas), and Water Fleas (Daphnia magna). Environ. Toxicol. Chem.18(1): 63-70.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	14	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	16.38	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11.8	NA	NR	ug/L	LAB	1996. Hogstrand, C., F. Galvez, and C.M. Wood. Toxicity, Silver Accumulation and Metallothionein Induction in Freshwater Rainbow Trout During Exposure to Different Silver Salts. Environ. Toxicol. Chem.15(7): 1102-1108.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10.5	D	8.9	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18.4	D	10.6	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18.5	D	6.1	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	25.6	D	5.3	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	27.7	D	5.1	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7.5	D	5.6	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9.2	D	5.2	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9.9	D	8	ug/L	LAB	1999. Bury, N.R., F. Galvez, and C.M. Wood. Effects of Chloride, Calcium, and Dissolved Organic Carbon on Silver Toxicity: Comparison Between Rainbow Trout and Fathead Minnows. Environ. Toxicol. Chem.18(1): 56-62.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10.9	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	108.9	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11.8	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	19.92	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	22.5	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	24.6	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	31.8	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	48	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	54	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	72.89	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	84.4	NA	NR	ug/L	LAB	1981. Lemke, A.E.. Interlaboratory Comparison Acute Testing Set. EPA-600/3-81-005, U.S.EPA, Duluth, MN: 29 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	16.1	NA	NR	ug/L	LAB	1979. Nishiuchi, Y.. Toxicity of Pesticides to Animals in Freshwater. LXII. Suisan Zoshoku27(2): 119-124.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	19.2	NA	NR	ug/L	LAB	1979. Nishiuchi, Y.. Toxicity of Pesticides to Animals in Freshwater. LXII. Suisan Zoshoku27(2): 119-124.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Birge, W.J., and J.A. Zuiderveen. The Comparative Toxicity of Silver to Aquatic Biota. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 79-87.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4.8	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9.1	NA	NR	ug/L	LAB	1996. Hogstrand, C., F. Galvez, and C.M. Wood. Toxicity, Silver Accumulation and Metallothionein Induction in Freshwater Rainbow Trout During Exposure to Different Silver Salts. Environ. Toxicol. Chem.15(7): 1102-1108.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	L	0.0285	NA	NR	uM	LAB	1997. Galvez, F., and C.M. Wood. The Relative Importance of Water Hardness and Chloride Levels in Modifying the Acute Toxicity of Silver to Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.16(11): 2363-2368.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	L	0.0289	NA	NR	uM	LAB	1997. Galvez, F., and C.M. Wood. The Relative Importance of Water Hardness and Chloride Levels in Modifying the Acute Toxicity of Silver to Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.16(11): 2363-2368.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	0.0294	NA	NR	uM	LAB	1997. Galvez, F., and C.M. Wood. The Relative Importance of Water Hardness and Chloride Levels in Modifying the Acute Toxicity of Silver to Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.16(11): 2363-2368.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Silver	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1.8	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Silver	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	6.8	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Silver	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	11	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	0.16	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	0.17	NA	NR	ug/L	LAB	1978. Davies, P.H., J.P.,Jr. Goettl, and J.R. Sinley. Toxicity of Silver to Rainbow Trout (Salmo gairdneri). Water Res.12(2): 113-117.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	0.17	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1.21	D	0.13	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	0.82	D	0.07	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	0.853		NC	ug/L	LAB	2002. Brauner, C.J., and C.M. Wood. Ionoregulatory Development and the Effect of Chronic Silver Exposure on Growth, Survival, and Sublethal Indicators of Toxicity in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(2): 153-162.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	13.51		NC	ug/L	LAB	2001. Guadagnolo, C.M., C.J. Brauner, and C.M. Wood. Chronic Effects of Silver Exposure on Ion Levels, Survival, and Silver Distribution Within Developing Rainbow Trout (Oncorhynchus mykiss) Embryos. Environ. Toxicol. Chem.20(3): 553-560.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	0.087		NC	uM	LAB	2005. Bertram, B.O.B., and R.C. Playle. Effects of Waterborne Complexing Agents on Silver Uptake and Depuration in Rainbow Trout. J. Fish Biol.66(1): 182-197.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	0.118		NC	uM	LAB	2002. Bertram, B.O.B., and R.C. Playle. Effects of Feeding on Waterborne Silver Uptake and Depuration in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.59(2): 350-360.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LOEL	Not Reported	T	2.88		NC	ug/L	LAB	2007. Dethloff, G.M., R.B. Naddy, and J.W. Gorsuch. Effects of Sodium Chloride on Chronic Silver Toxicity to Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.26(8): 1717-1725.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LR50	Gill(s)	T	191		NC	ug/L	LAB	2004. Morgan, T.P., and C.M. Wood. A Relationship Between Gill Silver Accumulation and Acute Silver Toxicity in the Freshwater Rainbow Trout: Support for the Acute Silver Biotic Ligand Model. Environ. Toxicol. Chem.23(5): 1261-1267.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.79	D	0.07	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.21	D	0.13	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.09	D	0.07	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.09	D	0.07	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.79	D	0.07	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.21	D	0.13	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.09	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.79	D	0.07	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.21	D	0.13	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.09	D	0.005	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.09	NA	NR	ug/L	LAB	1978. Davies, P.H., J.P.,Jr. Goettl, and J.R. Sinley. Toxicity of Silver to Rainbow Trout (Salmo gairdneri). Water Res.12(2): 113-117.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.09	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.09	D	0.005	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.09	D	0.005	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	1.21	D	0.13	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.79	D	0.07	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.82	D	0.07	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.79	D	0.07	ug/L	LAB	2005. Morgan, T.P., C.M. Guadagnolo, M. Grosell, and C.M. Wood. Effects of Water Hardness on Toxicological Responses to Chronic Waterborne Silver Exposure in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.24(7): 1642-1647.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	0.098		NC	ug/L	LAB	2002. Brauner, C.J., and C.M. Wood. Ionoregulatory Development and the Effect of Chronic Silver Exposure on Growth, Survival, and Sublethal Indicators of Toxicity in Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.172(2): 153-162.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	14.13		NC	ug/L	LAB	2000. Guadagnolo, C.M., C.J. Brauner, and C.M. Wood. Effects of an Acute Silver Challenge on Survival, Silver Distribution and Ionoregulation Within Developing Rainbow Trout Eggs (Oncorhynchus mykiss). Aquat. Toxicol.51(2): 195-211.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	14.13		NC	ug/L	LAB	2000. Guadagnolo, C.M., C.J. Brauner, and C.M. Wood. Effects of an Acute Silver Challenge on Survival, Silver Distribution and Ionoregulation Within Developing Rainbow Trout Eggs (Oncorhynchus mykiss). Aquat. Toxicol.51(2): 195-211.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	14.13		NC	ug/L	LAB	2000. Guadagnolo, C.M., C.J. Brauner, and C.M. Wood. Effects of an Acute Silver Challenge on Survival, Silver Distribution and Ionoregulation Within Developing Rainbow Trout Eggs (Oncorhynchus mykiss). Aquat. Toxicol.51(2): 195-211.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	1.22		NC	ug/L	LAB	2001. Guadagnolo, C.M., C.J. Brauner, and C.M. Wood. Chronic Effects of Silver Exposure on Ion Levels, Survival, and Silver Distribution Within Developing Rainbow Trout (Oncorhynchus mykiss) Embryos. Environ. Toxicol. Chem.20(3): 553-560.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	0.105		NC	uM	LAB	2005. Bertram, B.O.B., and R.C. Playle. Effects of Waterborne Complexing Agents on Silver Uptake and Depuration in Rainbow Trout. J. Fish Biol.66(1): 182-197.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	0.164		NC	uM	LAB	2005. Bertram, B.O.B., and R.C. Playle. Effects of Waterborne Complexing Agents on Silver Uptake and Depuration in Rainbow Trout. J. Fish Biol.66(1): 182-197.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	0.041		NC	uM	LAB	2005. Bertram, B.O.B., and R.C. Playle. Effects of Waterborne Complexing Agents on Silver Uptake and Depuration in Rainbow Trout. J. Fish Biol.66(1): 182-197.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	1.64		NC	ug/L	LAB	2007. Dethloff, G.M., R.B. Naddy, and J.W. Gorsuch. Effects of Sodium Chloride on Chronic Silver Toxicity to Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.26(8): 1717-1725.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NOEL	Not Reported	T	1.48		NC	ug/L	LAB	2007. Dethloff, G.M., R.B. Naddy, and J.W. Gorsuch. Effects of Sodium Chloride on Chronic Silver Toxicity to Early Life Stages of Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.26(8): 1717-1725.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1974. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-9, DNR, Boulder, CO: 96 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	0.36	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	0.51	NA	NR	ug/L	LAB	1983. Nebeker, A.V., C.K. McAuliffe, R. Mshar, and D.G. Stevens. Toxicity of Silver to Steelhead and Rainbow Trout, Fathead Minnows and Daphnia magna. Environ. Toxicol. Chem.2: 95-104.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	D	NR	uM	LAB	1997. Galvez, F., and C.M. Wood. The Relative Importance of Water Hardness and Chloride Levels in Modifying the Acute Toxicity of Silver to Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.16(11): 2363-2368.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1.7	NR	NR	ug/L	LAB	1998. Galvez, F., C. Hogstrand, and C.M. Wood. Physiological Responses of Juvenile Rainbow Trout to Chronic Low Level Exposure of Waterborne Silver. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.119(2): 131-137.
Silver	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	7.2	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2.2	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Silver	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3.9	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.07		NC	uM	LAB	2000. Rose-Janes, N.G., and R.C. Playle. Protection by Two Complexing Agents, Thiosulphate and Dissolved Organic Matter, Against the Physiological Effects of Silver Nitrate to Rainbow Trout (Oncorhynchus mykiss) in Ion-Poor Water. Aquat. Toxicol.51(1): 1-18.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.12		NC	uM	LAB	2000. Rose-Janes, N.G., and R.C. Playle. Protection by Two Complexing Agents, Thiosulphate and Dissolved Organic Matter, Against the Physiological Effects of Silver Nitrate to Rainbow Trout (Oncorhynchus mykiss) in Ion-Poor Water. Aquat. Toxicol.51(1): 1-18.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.222		NC	uM	LAB	2005. Bertram, B.O.B., and R.C. Playle. Effects of Waterborne Complexing Agents on Silver Uptake and Depuration in Rainbow Trout. J. Fish Biol.66(1): 182-197.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.095		NC	uM	LAB	2002. Bertram, B.O.B., and R.C. Playle. Effects of Feeding on Waterborne Silver Uptake and Depuration in Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.59(2): 350-360.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.7	NR	NR	ug/L	LAB	1998. Galvez, F., C. Hogstrand, and C.M. Wood. Physiological Responses of Juvenile Rainbow Trout to Chronic Low Level Exposure of Waterborne Silver. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.119(2): 131-137.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	10	NA	NR	ug/L	LAB	1997. Morgan, I.J., R.P. Henry, and C.M. Wood. The Mechanism of Acute Silver Nitrate Toxicity in Freshwater Rainbow Trout (Oncorhynchus mykiss) is Inhibition of Gill Na+ and Cl- Transport. Aquat. Toxicol.38: 145-163.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	0.09	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Nitric acid, silver (1+) salt	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100000	NA	NR	ug/L	LAB	1996. Hogstrand, C., F. Galvez, and C.M. Wood. Toxicity, Silver Accumulation and Metallothionein Induction in Freshwater Rainbow Trout During Exposure to Different Silver Salts. Environ. Toxicol. Chem.15(7): 1102-1108.
Silver chloride	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100000	NA	NR	ug/L	LAB	1996. Hogstrand, C., F. Galvez, and C.M. Wood. Toxicity, Silver Accumulation and Metallothionein Induction in Freshwater Rainbow Trout During Exposure to Different Silver Salts. Environ. Toxicol. Chem.15(7): 1102-1108.
Nitric acid, silver (1+) salt	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	62.27	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	38.91	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	29.67	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	20.79	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	18.89	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Speckled Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	13.6	NA	NR	ug/L	LAB	1978. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-13, DNR, Boulder, CO: 46.
Nitric acid, silver (1+) salt	Speckled Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	4.9	NA	NR	ug/L	LAB	1978. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-13, DNR, Boulder, CO: 46.
Nitric acid, silver (1+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	3	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.

Table C-22. Summary of Results from the EcoTox Database for Fish - Silver

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Threespine Stickleback	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.
Nitric acid, silver (1+) salt	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	43.63	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	18.76	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	13.95	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	9.73	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	7.55	NA	NR	ug/L	LAB	1988. Khangarot, B.S., and P.K. Ray. The Acute Toxicity of Silver to Some Freshwater Fishes. Acta Hydrochim. Hydrobiol.16(5): 541-545.
Nitric acid, silver (1+) salt	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	23.5	NA	NR	ug/L	LAB	1990. Diamond, J.M., D.G. Mackler, M. Collins, and D. Gruber. Derivation of a Freshwater Silver Criteria for the New River, Virginia, Using Representative Species. Environ. Toxicol. Chem.9(11): 1425-1434.
Nitric acid, silver (1+) salt	Zander	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1975. Stangenberg, M.. The Influence of the Chemical Composition of Water on the Pike Perch (Lucioperca lucioperca L.) Fry from the Lake Gopio. Limnologica9(3): 421-426.
Nitric acid, silver (1+) salt	Zander	Fish	Fresh	Mortality	NR	Not Reported	T	50	NA	NR	ug/L	LAB	1975. Stangenberg, M.. The Influence of the Chemical Composition of Water on the Pike Perch (Lucioperca lucioperca L.) Fry from the Lake Gopio. Limnologica9(3): 421-426.
Nitric acid, silver (1+) salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	D	22.2		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Nitric acid, silver (1+) salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	D	7070		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Nitric acid, silver (1+) salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	D	7200		NC	ug/L	LAB	2008. Griffitt, R.J., J. Luo, J. Gao, J.C. Bonzongo, and D.S. Barber. Effects of Particle Composition and Species on Toxicity of Metallic Nanomaterials in Aquatic Organisms. Environ. Toxicol. Chem.27(9): 1972-1978.
Nitric acid, silver (1+) salt	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	10.3		NC	ug/L	LAB	2008. Bielmyer, G.K., K.V. Brix, and M. Grosell. Is Cl- Protection Against Silver Toxicity Due to Chemical Speciation?. Aquat. Toxicol.87(2): 81-87.
Silver	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	D	NR	ug/L	LAB	2009. Griffitt, R.J., K. Hyndman, N.D. Denslow, and D.S. Barber. Comparison of Molecular and Histological Changes in Zebrafish Gills Exposed to Metallic Nanoparticles. Toxicol. Sci.107(2): 404-415.
Nitric acid, silver (1+) salt	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	NR	NR	NR	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

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Table C-23. Summary of Results from the EcoTox Database for Fish - Strontium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Strontium chloride	Common Carp	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	T	894	NA	NR	Bq/L	FIELDN	1990. Stanek, Z., M. Penaz, and E. Wohlgemuth. Accumulation and Kinetics of 90Sr in Fishes and Other Components of an Artificial Aquatic System. Folia Zool.39(4): 375-383.
Strontium chloride	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8580	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Strontium	Rainbow Trout	Fish	Fresh	Mortality	LC01	Not Reported	T	13	NR	NR	ug/L	LAB	1981. Birge, W.J., J.A. Black, and B.A. Ramey. The Reproductive Toxicology of Aquatic Contaminants. In: J.Saxena and F.Fisher (Eds.), Hazard Assessment of Chemicals: Current Developments, Academic Press, New York, NY1: 59-115.
Strontium	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	49	NR	NR	ug/L	LAB	1981. Birge, W.J., J.A. Black, and B.A. Ramey. The Reproductive Toxicology of Aquatic Contaminants. In: J.Saxena and F.Fisher (Eds.), Hazard Assessment of Chemicals: Current Developments, Academic Press, New York, NY1: 59-115.
Strontium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Strontium chloride	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Strontium chloride	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Strontium nitrate	Threespine Stickleback	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1200000	NA	NR	ug/L	LAB	1939. Jones, J.R.E.. The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback (Gasterosteus aculeatus L.). J. Exp. Biol.16(4): 425-437.

Table C-24. Summary of Results from the EcoTox Database for Fish - Thallium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Dithallium(1+) salt	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	120000	NR	NR	ug/L	LAB	1981. Buccafusco, R.J., S.J. Ells, and G.A. LeBlanc. Acute Toxicity of Priority Pollutants to Bluegill (Lepomis macrochirus). Bull. Environ. Contam. Toxicol.26(4): 446-452.
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	81	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	120	NR	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	145	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	200	NR	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	57	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	108	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	40	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	40	NR	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	81	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	120	NR	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	860	NA	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1780	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1810	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1290	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	350	NR	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	292	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	40	NA	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	206	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	200	NR	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	145	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Sulfuric acid, Dithallium(1+) salt	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	350	NA	NR	ug/L	LAB	1984. LeBlanc, G.A., and J.W. Dean. Antimony and Thallium Toxicity to Embryos and Larvae of Fathead Minnows (Pimephales promelas). Bull. Environ. Contam. Toxicol.32(5): 565-569.
Thallium chloride	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.

Table C-24. Summary of Results from the EcoTox Database for Fish - Thallium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Thallium	Perch	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	NR	1962. Nehring, D.. Experiments on the Toxicological Effects of Thallium Ions on Fish and Fish-Food Organisms (Untersuchungen uber die Toxikologische Wirkung von Thallium-Ionen auf Fische und Fischnahrtiere). Z. Fisch. Hilfswiss.11: 557-561.
Thallium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Sulfuric acid, Dithallium(1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1979. Craig, G.R., and G.L. Beggs. Evaluation of Fish Loading Rates in Regulatory Static Bioassays. Tech.Rep.Fish.Mar.Serv.#862: 146-160.
Sulfuric acid, Dithallium(1+) salt	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2300	NR	NR	ug/L	LAB	1983. Horne, J.D., M.A. Swirsky, T.A. Hollister, B.R. Oblad, and J.H. Kennedy. 5Aquatic Toxicity Studies of Five Priority Pollutants. Rep.No.4398, Final Report, EPA Contract No.68-01-6201, NUS Corp., Houston, TX: 196 p..
Thallium chloride	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Thallium chloride	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	180	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.

Table C-25. Summary of Results from the EcoTox Database for Fish - Uranium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Bis(nitrato-o,o')dioxouranium	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	46000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	46000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	46000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Bonytail	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Bonytail	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Bonytail	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Bonytail	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	36000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Bonytail	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	36000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Bonytail	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	36000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Dioxo[sulfato(2-)-O,O']-uranium	Brook Trout	Fish	Fresh	Growth	NR	Not Reported	T	9080	NA	NR	ug/L	LAB	1984. Parkhurst, B.R., R.G. Elder, J.S. Meyer, D.A. Sanchez, R.W. Pennak, and W.T. Waller. An Environmental Hazard Evaluation of Uranium in a Rocky Mountain Stream. Environ. Toxicol. Chem.3(1): 113-124.
Dioxo[sulfato(2-)-O,O']-uranium	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	59000	NA	NR	ug/L	LAB	1984. Parkhurst, B.R., R.G. Elder, J.S. Meyer, D.A. Sanchez, R.W. Pennak, and W.T. Waller. An Environmental Hazard Evaluation of Uranium in a Rocky Mountain Stream. Environ. Toxicol. Chem.3(1): 113-124.
Dioxo[sulfato(2-)-O,O']-uranium	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	23000	NA	NR	ug/L	LAB	1984. Parkhurst, B.R., R.G. Elder, J.S. Meyer, D.A. Sanchez, R.W. Pennak, and W.T. Waller. An Environmental Hazard Evaluation of Uranium in a Rocky Mountain Stream. Environ. Toxicol. Chem.3(1): 113-124.
Dioxo[sulfato(2-)-O,O']-uranium	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5500	NA	NR	ug/L	LAB	1984. Parkhurst, B.R., R.G. Elder, J.S. Meyer, D.A. Sanchez, R.W. Pennak, and W.T. Waller. An Environmental Hazard Evaluation of Uranium in a Rocky Mountain Stream. Environ. Toxicol. Chem.3(1): 113-124.
Uranium	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Uranium	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7200	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Dioxo[sulfato(2-)-O,O']-uranium	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	D	9080	NA	NR	ug/L	LAB	1984. Parkhurst, B.R., R.G. Elder, J.S. Meyer, D.A. Sanchez, R.W. Pennak, and W.T. Waller. An Environmental Hazard Evaluation of Uranium in a Rocky Mountain Stream. Environ. Toxicol. Chem.3(1): 113-124.
Dioxo[sulfato(2-)-O,O']-uranium	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	D	2260	NA	NR	ug/L	LAB	1984. Parkhurst, B.R., R.G. Elder, J.S. Meyer, D.A. Sanchez, R.W. Pennak, and W.T. Waller. An Environmental Hazard Evaluation of Uranium in a Rocky Mountain Stream. Environ. Toxicol. Chem.3(1): 113-124.
Dioxo[sulfato(2-)-O,O']-uranium	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2260	NA	NR	ug/L	LAB	1984. Parkhurst, B.R., R.G. Elder, J.S. Meyer, D.A. Sanchez, R.W. Pennak, and W.T. Waller. An Environmental Hazard Evaluation of Uranium in a Rocky Mountain Stream. Environ. Toxicol. Chem.3(1): 113-124.
Dioxo[sulfato(2-)-O,O']-uranium	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	610	NA	NR	ug/L	LAB	1984. Parkhurst, B.R., R.G. Elder, J.S. Meyer, D.A. Sanchez, R.W. Pennak, and W.T. Waller. An Environmental Hazard Evaluation of Uranium in a Rocky Mountain Stream. Environ. Toxicol. Chem.3(1): 113-124.
Dioxo[sulfato(2-)-O,O']-uranium	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	9080	NA	NR	ug/L	LAB	1984. Parkhurst, B.R., R.G. Elder, J.S. Meyer, D.A. Sanchez, R.W. Pennak, and W.T. Waller. An Environmental Hazard Evaluation of Uranium in a Rocky Mountain Stream. Environ. Toxicol. Chem.3(1): 113-124.
Uranium	Brook Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5000	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Dioxo[sulfato(2-)-O,O']-uranium	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	1390	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	1570	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Checkered Rainbow Fish	Fish	Fresh	Mortality	LOEC	Not Reported	T	1090	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Checkered Rainbow Fish	Fish	Fresh	Mortality	LOEC	Not Reported	T	1560	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Checkered Rainbow Fish	Fish	Fresh	Mortality	NOEC	Not Reported	T	560	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.

Table C-25. Summary of Results from the EcoTox Database for Fish - Uranium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Dioxo[sulfato(2-)-O,O']-uranium	Checkered Rainbow Fish	Fish	Fresh	Mortality	NOEC	Not Reported	T	810	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Bis(nitrato-o,o')dioxouranium	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	46000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	46000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	46000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Colorado Squawfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Colorado Squawfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Colorado Squawfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Colorado Squawfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	36000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Colorado Squawfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	36000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Colorado Squawfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	36000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Eastern Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	2570	NA	NR	ug/L	LAB	1994. Keklak, M.M., M.C. Newman, and M. Mulvey. Enhanced Uranium Tolerance of an Exposed Population of the Eastern Mosquitofish (Gambusia holbrooki Girard 1859). Arch. Environ. Contam. Toxicol.27(1): 20-24.
Dioxo[sulfato(2-)-O,O']-uranium	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	135000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Dioxo[sulfato(2-)-O,O']-uranium	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	2800	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Bis(nitrato-o,o')dioxouranium	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	3100	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Bis(nitrato-o,o')dioxouranium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	50000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	100000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	50000	NA	NR	ug/L	LAB	1984. Poston, T.M., R.W.,Jr. Hanf, and M.A. Simmons. Toxicity of Uranium to Daphnia magna. Water Air Soil Pollut.22(3): 289-298.
Bis(nitrato-o,o')dioxouranium	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	43500	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Bis(nitrato-o,o')dioxouranium	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	43500	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Bis(nitrato-o,o')dioxouranium	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	43500	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Bis(nitrato-o,o')dioxouranium	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	43500	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Uranium	Lake Whitefish	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Cooley, H.M., R.E. Evans, and J.F. Klaverkamp. Toxicology of Dietary Uranium in Lake Whitefish (Coregonus clupeaformis). Aquat. Toxicol.48(4): 495-515.
Uranium	Lake Whitefish	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Cooley, H.M., R.E. Evans, and J.F. Klaverkamp. Toxicology of Dietary Uranium in Lake Whitefish (Coregonus clupeaformis). Aquat. Toxicol.48(4): 495-515.
Uranium	Lake Whitefish	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	2000. Cooley, H.M., R.E. Evans, and J.F. Klaverkamp. Toxicology of Dietary Uranium in Lake Whitefish (Coregonus clupeaformis). Aquat. Toxicol.48(4): 495-515.
Uranium	Mosquitofish	Fish	NR	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	NR	1992. Keklak, M.M., M.C. Newman, and M. Mulvey. Enhanced Uranium Tolerance of an Exposed Fish Population. Bull. S. C. Acad. Sci.54: 81.

Table C-25. Summary of Results from the EcoTox Database for Fish - Uranium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	1570	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	3290	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	3290	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	1590	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	2690	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	3290	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	LOEC	Not Reported	T	1090	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	LOEC	Not Reported	T	4320	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	LOEC	Not Reported	T	1560	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	NOEC	Not Reported	T	2260	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	NOEC	Not Reported	T	560	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Dioxo[sulfato(2-)-O,O']-uranium	Purple Spotted Gudgeon	Fish	Fresh	Mortality	NOEC	Not Reported	T	810	NA	NR	ug/L	LAB	1992. Holdway, D.A.. Uranium Toxicity to Two Species of Australian Tropical Fish. Sci. Total Environ.125: 137-158.
Uranium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6200	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Uranium	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Uranium	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5000	NR	NR	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Bis(nitrato-o,o')dioxouranium	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	46000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	46000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	46000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Razorback Sucker	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Razorback Sucker	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Razorback Sucker	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	60000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Razorback Sucker	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	36000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Razorback Sucker	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	36000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Bis(nitrato-o,o')dioxouranium	Razorback Sucker	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	36000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Uranium	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	6400		NC	ug/L	LAB	2005. Borgmann, U., Y. Couillard, P. Doyle, and D.G. Dixon. Toxicity of Sixty-Three Metals and Metalloids to Hyalella azteca at Two Levels of Water Hardness. Environ. Toxicol. Chem.24(3): 641-652.

Table C-26. Summary of Results from the EcoTox Database for Fish - Vanadium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
oxo[Sulfato(2-)-o]vanadium	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	55000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
oxo[Sulfato(2-)-o]vanadium	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	6000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	17000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	18000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	36000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	17000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	15000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	14000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	14000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	14000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NA	NR	ug/L	LAB	1987. Ernst, W.R., and E.T. Garside. Lethal Effects of Vanadium to Two Life Stages of Brook Trout Salvelinus fontinalis (Mitchill). Can. J. Zool.65(3): 628-634.
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	240	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	480	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	170	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	340	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..

Table C-26. Summary of Results from the EcoTox Database for Fish - Vanadium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	120	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	240	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1900	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1.8	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1160	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	960	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	13000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	55000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
oxo[Sulfato(2-)-o]vanadium	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	30000	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
oxo[Sulfato(2-)-o]vanadium	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	4800	NA	NR	ug/L	LAB	1960. Tarzwell, C.M., and C. Henderson. Toxicity of Less Common Metals to Fishes. Ind. Wastes5: 12.
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	480	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1978. Kimball, G.. The Effects of Lesser Known Metals and One Organic to Fathead Minnows (Pimephales promelas) and Daphnia magna. Manuscr., Dep.of Entomol., Fish.and Wildl., Univ.of Minnesota, Minneapolis, MN: 88 p..
Vanadium pentoxide	Flagfish	Fish	Fresh	Growth	NR		T	41	NA	NR	ug/L	LAB	1979. Holdway, D.A., and J.B. Sprague. Chronic Toxicity of Vanadium to Flagfish. Water Res.13(9): 905-910.
Vanadium pentoxide	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	11200	NA	NR	ug/L	LAB	1979. Holdway, D.A., and J.B. Sprague. Chronic Toxicity of Vanadium to Flagfish. Water Res.13(9): 905-910.

Table C-26. Summary of Results from the EcoTox Database for Fish - Vanadium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
oxo[Sulfato(2-)-o]vanadium	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	19910	NA	NR	ug/L	LAB	1985. Srivastava, D.K., and R.K. Tyagi. Toxicity of Selenium and Vanadium to the Striped Gourami, Colisa fasciatus (Bloch and Schneider). Acta Hydrobiol.25/26(3/4): 481-486.
oxo[Sulfato(2-)-o]vanadium	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1985. Srivastava, D.K., and R.K. Tyagi. Toxicity of Selenium and Vanadium to the Striped Gourami, Colisa fasciatus (Bloch and Schneider). Acta Hydrobiol.25/26(3/4): 481-486.
oxo[Sulfato(2-)-o]vanadium	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	8210	NA	NR	ug/L	LAB	1985. Srivastava, D.K., and R.K. Tyagi. Toxicity of Selenium and Vanadium to the Striped Gourami, Colisa fasciatus (Bloch and Schneider). Acta Hydrobiol.25/26(3/4): 481-486.
oxo[Sulfato(2-)-o]vanadium	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	6410	NA	NR	ug/L	LAB	1985. Srivastava, D.K., and R.K. Tyagi. Toxicity of Selenium and Vanadium to the Striped Gourami, Colisa fasciatus (Bloch and Schneider). Acta Hydrobiol.25/26(3/4): 481-486.
oxo[Sulfato(2-)-o]vanadium	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	4950	NA	NR	ug/L	LAB	1985. Srivastava, D.K., and R.K. Tyagi. Toxicity of Selenium and Vanadium to the Striped Gourami, Colisa fasciatus (Bloch and Schneider). Acta Hydrobiol.25/26(3/4): 481-486.
Vanadium pentoxide	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4520*	NA	NR	ug/L	LAB	1979. Knudtson, B.K.. Acute Toxicity of Vanadium to Two Species of Freshwater Fish. Bull. Environ. Contam. Toxicol.23(1-2): 95-99.
Vanadium pentoxide	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4600	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
oxo[Sulfato(2-)-o]vanadium	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1020*	NA	NR	ug/L	LAB	1979. Knudtson, B.K.. Acute Toxicity of Vanadium to Two Species of Freshwater Fish. Bull. Environ. Contam. Toxicol.23(1-2): 95-99.
Vanadium pentoxide	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	588*	NA	NR	ug/L	LAB	1979. Knudtson, B.K.. Acute Toxicity of Vanadium to Two Species of Freshwater Fish. Bull. Environ. Contam. Toxicol.23(1-2): 95-99.
oxo[Sulfato(2-)-o]vanadium	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	128*	NA	NR	ug/L	LAB	1979. Knudtson, B.K.. Acute Toxicity of Vanadium to Two Species of Freshwater Fish. Bull. Environ. Contam. Toxicol.23(1-2): 95-99.
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2400	D	2400	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3700	D	3700	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	D	2000	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3500	D	3500	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2700	D	2700	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	D	10000	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11700	D	11700	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	13200	D	13200	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5200	D	5200	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6100	D	6100	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6200	D	6200	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6400	D	6400	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8000	D	8000	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	118000	NA	NR	ug/L	LAB	1982. Giles, M.A., and J.F. Klaverkamp. The Acute Toxicity of Vanadium and Copper to Eyed Eggs of Rainbow Trout (Salmo gairdneri). Water Res.16(6): 885-889.
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2200	D	2200	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3300	D	3300	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4600	D	4600	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5100	D	5100	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5500	D	5500	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6300	D	6300	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..

Table C-26. Summary of Results from the EcoTox Database for Fish - Vanadium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7400	D	7400	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	8100	D	8100	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	D	2000	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2400	D	2400	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2400	D	2400	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	D	2500	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	D	2500	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	D	2900	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	D	3000	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3000	D	3000	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3400	D	3400	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3600	D	3600	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3700	D	3700	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3800	D	3800	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4200	D	4200	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4600	D	4600	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4800	D	4800	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5400	D	5400	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5600	D	5600	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2600	D	2600	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2700	D	2700	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	D	2900	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3300	D	3300	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3400	D	3400	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..

Table C-26. Summary of Results from the EcoTox Database for Fish - Vanadium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4300	D	4300	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2600	D	2600	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2700	D	2700	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4100	D	4100	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	D	2500	ug/L	LAB	1982. Stendahl, D.H., and J.B. Sprague. Effects of Water Hardness and pH on Vanadium Lethality to Rainbow Trout. Water Res..
Vanadium pentoxide	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Vanadium	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Air-Breathing Catfish Family	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	4000		NC	ug/L	LAB	2005. Oti, E.E., and D.A. Avoaja. Haematological Assessment of Freshwater Catfishes, Clarias gariepinus (Burch) and "Heteroclarias" (Hybrid) Exposed to Sublethal Concentrations of Zinc. Pak. J. Zool.37(2): 101-105.
Zinc	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	21400	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	20100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	American Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	14500	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc nitrate	American Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	21600	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	American Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	20000	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	American Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	14600	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	1890	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	203	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	255	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	414	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	4700	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	5140	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	112	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	142	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	1580	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	166	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	168	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	168	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	2920	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Arctic Grayling	Fish	Fresh	Mortality	LC50	Not Reported	T	315	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Sulfuric acid, Zinc salt (1:1)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	87900		NC	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Zinc to Freshwater Teleosts, Notopterus notopterus (Pallas) and Puntius javanicus (Blkr.). J. Freshw. Biol.5(4): 359-363.
Sulfuric acid, Zinc salt (1:1)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	74550		NC	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Zinc to Freshwater Teleosts, Notopterus notopterus (Pallas) and Puntius javanicus (Blkr.). J. Freshw. Biol.5(4): 359-363.
Sulfuric acid, Zinc salt (1:1)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	67600		NC	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Zinc to Freshwater Teleosts, Notopterus notopterus (Pallas) and Puntius javanicus (Blkr.). J. Freshw. Biol.5(4): 359-363.
Sulfuric acid, Zinc salt (1:1)	Asiatic Knifefish	Fish	Fresh	Mortality	LC50	Not Reported	T	59790		NC	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Zinc to Freshwater Teleosts, Notopterus notopterus (Pallas) and Puntius javanicus (Blkr.). J. Freshw. Biol.5(4): 359-363.
Sulfuric acid, Zinc salt (1:1)	Asiatic Knifefish	Fish	Fresh	Mortality	NOEC	Not Reported	T	310.9		NC	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Zinc to Freshwater Teleosts, Notopterus notopterus (Pallas) and Puntius javanicus (Blkr.). J. Freshw. Biol.5(4): 359-363.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	NOEL	Whole Organism	T	101000		NC	ug/L	LAB	1993. Maage, A., and K. Julshamn. Assessment of Zinc Status in Juvenile Atlantic Salmon (Salmo salar) by Measurement of Whole Body and Tissue Levels of Zinc. Aquaculture117(1-2): 179-191.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	NOEL	Whole Organism	T	101000		NC	ug/L	LAB	1993. Maage, A., and K. Julshamn. Assessment of Zinc Status in Juvenile Atlantic Salmon (Salmo salar) by Measurement of Whole Body and Tissue Levels of Zinc. Aquaculture117(1-2): 179-191.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	NR	Whole Organism	T	NR		NC	ug/L	LAB	1993. Maage, A., and K. Julshamn. Assessment of Zinc Status in Juvenile Atlantic Salmon (Salmo salar) by Measurement of Whole Body and Tissue Levels of Zinc. Aquaculture117(1-2): 179-191.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Growth	NR	Not Reported	T	5	NA	NR	mM	LAB	1983. Eddy, F.B., and C. Talbot. Formation of the Perivitelline Fluid in Atlantic Salmon Eggs (Salmo salar) in Fresh Water and in Solutions of Metal Ions. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.75(1): 1-4.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1963. Water Pollution Research Board. Effects of Pollution on Fish. In: Water Pollution Research 1962, Water Pollut.Res.Board, Dep.of Sci.and Ind.Res., H.M.Stationery Off., London, England: 76-83.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1963. Water Pollution Research Board. Effects of Pollution on Fish. In: Water Pollution Research 1962, Water Pollut.Res.Board, Dep.of Sci.and Ind.Res., H.M.Stationery Off., London, England: 76-83.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1963. Water Pollution Research Board. Effects of Pollution on Fish. In: Water Pollution Research 1962, Water Pollut.Res.Board, Dep.of Sci.and Ind.Res., H.M.Stationery Off., London, England: 76-83.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1963. Water Pollution Research Board. Effects of Pollution on Fish. In: Water Pollution Research 1962, Water Pollut.Res.Board, Dep.of Sci.and Ind.Res., H.M.Stationery Off., London, England: 76-83.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1963. Water Pollution Research Board. Effects of Pollution on Fish. In: Water Pollution Research 1962, Water Pollut.Res.Board, Dep.of Sci.and Ind.Res., H.M.Stationery Off., London, England: 76-83.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1450	NA	NR	ug/L	LAB	1979. Farmer, G.J., D. Ashfield, and H.S. Samant. Effects of Zinc on Juvenile Atlantic Salmon Salmo salar: Acute Toxicity, Food Intake, Growth and Bioaccumulation. Environ. Pollut.19(2): 103-118.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1460	NA	NR	ug/L	LAB	1979. Farmer, G.J., D. Ashfield, and H.S. Samant. Effects of Zinc on Juvenile Atlantic Salmon Salmo salar: Acute Toxicity, Food Intake, Growth and Bioaccumulation. Environ. Pollut.19(2): 103-118.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1979. Farmer, G.J., D. Ashfield, and H.S. Samant. Effects of Zinc on Juvenile Atlantic Salmon Salmo salar: Acute Toxicity, Food Intake, Growth and Bioaccumulation. Environ. Pollut.19(2): 103-118.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1979. Farmer, G.J., D. Ashfield, and H.S. Samant. Effects of Zinc on Juvenile Atlantic Salmon Salmo salar: Acute Toxicity, Food Intake, Growth and Bioaccumulation. Environ. Pollut.19(2): 103-118.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	350	NA	NR	ug/L	LAB	1979. Farmer, G.J., D. Ashfield, and H.S. Samant. Effects of Zinc on Juvenile Atlantic Salmon Salmo salar: Acute Toxicity, Food Intake, Growth and Bioaccumulation. Environ. Pollut.19(2): 103-118.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	510	NA	NR	ug/L	LAB	1979. Farmer, G.J., D. Ashfield, and H.S. Samant. Effects of Zinc on Juvenile Atlantic Salmon Salmo salar: Acute Toxicity, Food Intake, Growth and Bioaccumulation. Environ. Pollut.19(2): 103-118.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	11.9	NA	NR	uM	LAB	1995. Roy, R., and P.G.C. Campbell. Survival Time Modeling of Exposure of Juvenile Atlantic Salmon (Salmo salar) to Mixture of Aluminum and Zinc in Soft Water at Low pH. Aquat. Toxicol.33(2): 155-176.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	5.1	NA	NR	uM	LAB	1995. Roy, R., and P.G.C. Campbell. Survival Time Modeling of Exposure of Juvenile Atlantic Salmon (Salmo salar) to Mixture of Aluminum and Zinc in Soft Water at Low pH. Aquat. Toxicol.33(2): 155-176.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Zitko, V., and W.G. Carson. Seasonal and Developmental Variation in the Lethality of Zinc to Juvenile Atlantic Salmon (Salmo salar). J. Fish. Res. Board Can.34(1): 139-141.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	LETC	Not Reported	T	740		NC	ug/L	LAB	1973. Zitko, P., W.V. Carson, and W.G. Carson. Prediction of Incipient Lethal Levels of Copper to Juvenile Atlantic Salmon in the Presence of Humic Acid by Cupric Electrode. Bull. Environ. Contam. Toxicol.10(5): 265-271.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	NR	Mortality	LETC	Not Reported	T	740	NR	NR	ug/L	LAB	1972. Carson, W.G., and W.V. Carson. Toxicity of Copper and Zinc to Juvenile Atlantic Salmon in the Presence of Humic Acid and Lignosulfonates. J.Fish.Res.Board Can.Manuscript Rep.Ser.No.1181: 14 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	1602		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1993. Maage, A., and K. Julshamn. Assessment of Zinc Status in Juvenile Atlantic Salmon (Salmo salar) by Measurement of Whole Body and Tissue Levels of Zinc. Aquaculture117(1-2): 179-191.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1966. Grande, M.. Effect of Copper and Zinc on Salmonid Fishes. Adv. Water Pollut. Res.3(1): 97-111.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1966. Grande, M.. Effect of Copper and Zinc on Salmonid Fishes. Adv. Water Pollut. Res.3(1): 97-111.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	200*	NA	NR	ug/L	LAB	1976. Peterson, R.H.. Temperature Selection of Juvenile Atlantic Salmon (Salmo salar) as Influenced by Various Toxic Substances. J. Fish. Res. Board Can.33(8): 1722-1730.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	917*	NA	NR	ug/L	LAB	1976. Zitko, V., and W.G. Carson. A Mechanism of the Effects of Water Hardness on the Lethality of Heavy Metals to Fish. Chemosphere5(5): 299-303.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	936*	NA	NR	ug/L	LAB	1976. Zitko, V., and W.G. Carson. A Mechanism of the Effects of Water Hardness on the Lethality of Heavy Metals to Fish. Chemosphere5(5): 299-303.
Sulfuric acid, Zinc salt (1:1)	Atlantic Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	936*	NA	NR	ug/L	LAB	1976. Zitko, V., and W.G. Carson. A Mechanism of the Effects of Water Hardness on the Lethality of Heavy Metals to Fish. Chemosphere5(5): 299-303.
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	22000		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	21562		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	21000		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3169.3		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4435.7		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1208		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	13710		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1767		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2401		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2863		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5326		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8199		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	98000		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1043		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1295		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	238		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	311		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	509		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	554		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	672.44		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Zinc chloride (ZnCl2)	Atlantic Salmon	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	722		NC	ug/L	LAB	1971. Cook, R.H., R.A. Hoos, and R.P. Cote. The Toxicity of Copper and Zinc to Atlantic Salmon; Laboratory and Field Evaluations with Special Emphasis on High Water Hardness Concentrations. Manuscr.Rep.No.71-16, Resour.Dev.Branch, Environ.Can., Fish.Serv.Halifax, Nova Scotia: 88 p..
Sulfuric acid, Zinc salt (1:1)	Australian Redtailed Rainbowfi	Fish	Fresh	Mortality	LC50	Not Reported	T	13900	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid, Zinc salt (1:1)	Australian Redtailed Rainbowfi	Fish	Fresh	Mortality	LC50	Not Reported	T	5980	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid, Zinc salt (1:1)	Australian Redtailed Rainbowfi	Fish	Fresh	Mortality	LC50	Not Reported	T	6800	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Zinc	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	23000	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	20400	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	Banded Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	19200	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc nitrate	Banded Killifish	Fish	Fresh	Mortality	LC50*	Not Reported	T	22600	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	Banded Killifish	Fish	Fresh	Mortality	LC50*	Not Reported	T	20700	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	Banded Killifish	Fish	Fresh	Mortality	LC50*	Not Reported	T	19100	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Sulfuric acid, Zinc salt (1:1)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	41050		NC	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Zinc to Freshwater Teleosts, Notopterus notopterus (Pallas) and Puntius javanicus (Blkr.). J. Freshw. Biol.5(4): 359-363.
Sulfuric acid, Zinc salt (1:1)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	37260		NC	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Zinc to Freshwater Teleosts, Notopterus notopterus (Pallas) and Puntius javanicus (Blkr.). J. Freshw. Biol.5(4): 359-363.
Sulfuric acid, Zinc salt (1:1)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	33440		NC	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Zinc to Freshwater Teleosts, Notopterus notopterus (Pallas) and Puntius javanicus (Blkr.). J. Freshw. Biol.5(4): 359-363.
Sulfuric acid, Zinc salt (1:1)	Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	29620		NC	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Zinc to Freshwater Teleosts, Notopterus notopterus (Pallas) and Puntius javanicus (Blkr.). J. Freshw. Biol.5(4): 359-363.
Sulfuric acid, Zinc salt (1:1)	Barb	Fish	Fresh	Mortality	NOEC	Not Reported	T	135.6		NC	ug/L	LAB	1993. Gupta, A.K., and P. Chakrabarti. Toxicity of Zinc to Freshwater Teleosts, Notopterus notopterus (Pallas) and Puntius javanicus (Blkr.). J. Freshw. Biol.5(4): 359-363.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	T	NR	NR	NR	ug/L	LAB	1971. Cairns, J.,Jr., and R.E. Sparks. The Use of Bluegills to Detect Zinc. U.S.EPA, Washington, DC: 45 p..
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1972. Sparks, R.E., J.,Jr. Cairns, and A.G. Heath. The Use of Bluegill Breathing Rates to Detect Zinc. Water Res.6(8): 895-911.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC0	Not Reported	T	2030	NA	NR	ug/L	LAB	1972. Cairns, J.,Jr., T.K. Bahns, D.T. Burton, K.L. Dickson, R.E. Sparks, and W.T. Waller. The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis macrochirus Raf.). Trans. Kans. Acad. Sci.74(1): 81-92.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC0	Not Reported	T	2780	NA	NR	ug/L	LAB	1972. Cairns, J.,Jr., T.K. Bahns, D.T. Burton, K.L. Dickson, R.E. Sparks, and W.T. Waller. The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis macrochirus Raf.). Trans. Kans. Acad. Sci.74(1): 81-92.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC100	Not Reported	T	17750	NA	NR	ug/L	LAB	1972. Cairns, J.,Jr., T.K. Bahns, D.T. Burton, K.L. Dickson, R.E. Sparks, and W.T. Waller. The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis macrochirus Raf.). Trans. Kans. Acad. Sci.74(1): 81-92.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC100	Not Reported	T	30480	NA	NR	ug/L	LAB	1972. Cairns, J.,Jr., T.K. Bahns, D.T. Burton, K.L. Dickson, R.E. Sparks, and W.T. Waller. The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis macrochirus Raf.). Trans. Kans. Acad. Sci.74(1): 81-92.
Zinc	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	12500	NR	NR	ug/L	LAB	1960. Academy of Natural Sciences. The Sensitivity of Aquatic Life to Certain Chemicals Commonly Found in Industrial Wastes. Final Rep.No.RG-3965(C2R1), U.S.Public Health Service Grant, Acad.of Nat.Sci., Philadelphia, PA: 89 p..
Zinc	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	12900	NR	NR	ug/L	LAB	1960. Academy of Natural Sciences. The Sensitivity of Aquatic Life to Certain Chemicals Commonly Found in Industrial Wastes. Final Rep.No.RG-3965(C2R1), U.S.Public Health Service Grant, Acad.of Nat.Sci., Philadelphia, PA: 89 p..
Zinc	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	3500	NR	NR	ug/L	LAB	1960. Academy of Natural Sciences. The Sensitivity of Aquatic Life to Certain Chemicals Commonly Found in Industrial Wastes. Final Rep.No.RG-3965(C2R1), U.S.Public Health Service Grant, Acad.of Nat.Sci., Philadelphia, PA: 89 p..
Zinc	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	4200	NR	NR	ug/L	LAB	1960. Academy of Natural Sciences. The Sensitivity of Aquatic Life to Certain Chemicals Commonly Found in Industrial Wastes. Final Rep.No.RG-3965(C2R1), U.S.Public Health Service Grant, Acad.of Nat.Sci., Philadelphia, PA: 89 p..
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	7500		NC	ug/L	LAB	1973. Cairns, J.,Jr., J.W. Hall, E.L. Morgan, R.E. Sparks, W.T. Waller, and G.F. Westlake. The Development of an Automated Biological Monitoring System for Water Quality. Bull.No.59, Virginia Water Resour.Res.Ctr., Virginia Polytechnic Inst.and State Univ., Blacksburg,VA: 50 p..
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	8020	NA	NR	ug/L	LAB	1958. Cairns, J.,Jr., and A. Scheier. The Effects of Periodic Low Oxygen upon the Toxicity of Various Chemicals to Aquatic Organisms. Proc. 12th Ind. Waste Conf. Purdue Univ. Eng. Ext. Ser. No. 94, Eng. Bull.42: 165-176.
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	4200	NA	NR	ug/L	LAB	1968. Cairns, J.,Jr., and A. Scheier. A Comparison of the Toxicity of Some Common Industrial Waste Components Tested Individually and Combined. Prog. Fish-Cult.30(1): 3-8.
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	6910	NA	NR	ug/L	LAB	1959. Cairns, J.,Jr., and A. Scheier. The Relationship of Bluegill Sunfish Body Size to Tolerance for Some Common Chemicals. In: Proc.13th Ind.Waste Conf.,Series No.95, Eng.Bull.43, Purdue Univ.,IN: 243-252.
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	7200	NA	NR	ug/L	LAB	1959. Cairns, J.,Jr., and A. Scheier. The Relationship of Bluegill Sunfish Body Size to Tolerance for Some Common Chemicals. In: Proc.13th Ind.Waste Conf.,Series No.95, Eng.Bull.43, Purdue Univ.,IN: 243-252.
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	7450	NA	NR	ug/L	LAB	1959. Cairns, J.,Jr., and A. Scheier. The Relationship of Bluegill Sunfish Body Size to Tolerance for Some Common Chemicals. In: Proc.13th Ind.Waste Conf.,Series No.95, Eng.Bull.43, Purdue Univ.,IN: 243-252.
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1957. Cairns, J.,Jr., and A. Scheier. The Effects of Temperature and Hardness of Water upon the Toxicity of Zinc to the Common Bluegill (Lepomis macrochirus Raf.). Not. Nat. (Phila.)299: 12.
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1957. Cairns, J.,Jr., and A. Scheier. The Effects of Temperature and Hardness of Water upon the Toxicity of Zinc to the Common Bluegill (Lepomis macrochirus Raf.). Not. Nat. (Phila.)299: 12.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	4500		NC	ug/L	LAB	2004. Van der Schalie, W.H., T.R. Shedd, M.W. Widder, and L.M. Brennan. Response Characteristics of an Aquatic Biomonitor Used for Rapid Toxicity Detection. J. Appl. Toxicol.24(5): 387-394.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	19100	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	23000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	8850	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50	Not Reported	T	3200	NR	NR	ug/L	LAB	1981. Cairns, J.,Jr., K.W. Thompson, and A.C. Hendricks. Effects of Fluctuating, Sublethal Applications of Heavy Metal Solutions upon the Gill Ventilation Response of Bluegills (Lepomis macrochirus). EPA-600/3-81-003, U.S.EPA, Cincinnati, OH: 104 p..
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	7240	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	7240	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	5370	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	9600*	NA	NR	ug/L	LAB	1957. Cairns, J.,Jr.. Environment and Time in Fish Toxicity. Ind. Wastes2(1): 1-4.
Zinc chloride (ZnCl2)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	1968. Patrick, R., J.,Jr. Cairns, and A. Scheier. The Relative Sensitivity of Diatoms, Snails, and Fish to Twenty Common Constituents of Industrial Wastes. Prog. Fish-Cult.30(3): 137-140.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	5750	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	6750	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	6950	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	7950	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	9070	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	5110	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	5460	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	5820	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	6140	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	6440	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	10500	NA	NR	ug/L	LAB	1968. Pickering, Q.H.. Some Effects of Dissolved Oxygen Concentrations upon the Toxicity of Zinc to the Bluegill, Lepomis macrochirus, Raf. Water Res.2: 187-194.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	10700	NA	NR	ug/L	LAB	1968. Pickering, Q.H.. Some Effects of Dissolved Oxygen Concentrations upon the Toxicity of Zinc to the Bluegill, Lepomis macrochirus, Raf. Water Res.2: 187-194.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	10700	NA	NR	ug/L	LAB	1968. Pickering, Q.H.. Some Effects of Dissolved Oxygen Concentrations upon the Toxicity of Zinc to the Bluegill, Lepomis macrochirus, Raf. Water Res.2: 187-194.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	12000	NA	NR	ug/L	LAB	1968. Pickering, Q.H.. Some Effects of Dissolved Oxygen Concentrations upon the Toxicity of Zinc to the Bluegill, Lepomis macrochirus, Raf. Water Res.2: 187-194.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	7200	NA	NR	ug/L	LAB	1968. Pickering, Q.H.. Some Effects of Dissolved Oxygen Concentrations upon the Toxicity of Zinc to the Bluegill, Lepomis macrochirus, Raf. Water Res.2: 187-194.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	7500	NA	NR	ug/L	LAB	1968. Pickering, Q.H.. Some Effects of Dissolved Oxygen Concentrations upon the Toxicity of Zinc to the Bluegill, Lepomis macrochirus, Raf. Water Res.2: 187-194.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	11200	NA	NR	ug/L	LAB	1972. Cairns, J.,Jr., T.K. Bahns, D.T. Burton, K.L. Dickson, R.E. Sparks, and W.T. Waller. The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis macrochirus Raf.). Trans. Kans. Acad. Sci.74(1): 81-92.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	3000	NA	NR	ug/L	LAB	1980. Thompson, K.W., A.C. Hendricks, and J.,Jr. Cairns. Acute Toxicity of Zinc and Copper Singly and in Combination to the Bluegill (Lepomis macrochirus). Bull. Environ. Contam. Toxicol.25(1): 122-129.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	3600	NA	NR	ug/L	LAB	1980. Thompson, K.W., A.C. Hendricks, and J.,Jr. Cairns. Acute Toxicity of Zinc and Copper Singly and in Combination to the Bluegill (Lepomis macrochirus). Bull. Environ. Contam. Toxicol.25(1): 122-129.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	9900	NA	NR	ug/L	LAB	1972. Cairns, J.,Jr., T.K. Bahns, D.T. Burton, K.L. Dickson, R.E. Sparks, and W.T. Waller. The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis macrochirus Raf.). Trans. Kans. Acad. Sci.74(1): 81-92.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	4850	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	5460	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	5820	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	6440	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	LC50*	Not Reported	T	6440	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Zinc	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	5000	NA	NR	ug/L	LAB	1973. Brown, E.R., L. Keith, J.J. Hazdra, and T. Arndt. Tumors in Fish Caught in Polluted Waters: Possible Explanations. In: Y.Ito and R.M.Dutcher (Eds.), Comparative Leukemia Research 1973, Leukemogenesis, Bibl.Haematol.No.40, Univ.of Tokyo Press, Tokyo/Karger, Basel: 47-57.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1971. Cairns, J.,Jr., and R.E. Sparks. The Use of Bluegills to Detect Zinc. U.S.EPA, Washington, DC: 45 p..
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1972. Sparks, R.E., J.,Jr. Cairns, and A.G. Heath. The Use of Bluegill Breathing Rates to Detect Zinc. Water Res.6(8): 895-911.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	8700	NR	NR	ug/L	LAB	1971. Cairns, J.,Jr., and R.E. Sparks. The Use of Bluegills to Detect Zinc. U.S.EPA, Washington, DC: 45 p..
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1972. Sparks, R.E., J.,Jr. Cairns, and A.G. Heath. The Use of Bluegill Breathing Rates to Detect Zinc. Water Res.6(8): 895-911.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	32000	NA	NR	ug/L	LAB	1972. Sparks, R.E., W.T. Waller, and J.,Jr. Cairns. Effect of Shelters on the Resistance of Dominant and Submissive Bluegills (Lepomis macrochirus) to a Lethal Concentration of Zinc. J. Fish. Res. Board Can.29(9): 1356-1358.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	32000	NA	NR	ug/L	LAB	1972. Sparks, R.E., W.T. Waller, and J.,Jr. Cairns. Effect of Shelters on the Resistance of Dominant and Submissive Bluegills (Lepomis macrochirus) to a Lethal Concentration of Zinc. J. Fish. Res. Board Can.29(9): 1356-1358.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	32000	NA	NR	ug/L	LAB	1972. Sparks, R.E., W.T. Waller, and J.,Jr. Cairns. Effect of Shelters on the Resistance of Dominant and Submissive Bluegills (Lepomis macrochirus) to a Lethal Concentration of Zinc. J. Fish. Res. Board Can.29(9): 1356-1358.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR	Not Reported	T	32000	NA	NR	ug/L	LAB	1972. Sparks, R.E., W.T. Waller, and J.,Jr. Cairns. Effect of Shelters on the Resistance of Dominant and Submissive Bluegills (Lepomis macrochirus) to a Lethal Concentration of Zinc. J. Fish. Res. Board Can.29(9): 1356-1358.
Zinc	Bluegill	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1973. Cairns, J.,Jr., R.E. Sparks, and W.T. Waller. The Use of Fish as Sensors in Industrial Waste Lines to Prevent Fish Kills. Hydrobiologia41(2): 151-167.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	6000		NC	ug/L	LAB	1972. Sparks, R.E., J.,Jr. Cairns, R.A. McNabb, and G. Suter II. Monitoring Zinc Concentrations in Water Using the Respiratory Response of Bluegills (Lepomis macrochirus Rafinesque). Hydrobiologia40(3): 361-369.
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1971. Cairns, J.,Jr., and R.E. Sparks. The Use of Bluegills to Detect Zinc. U.S.EPA, Washington, DC: 45 p..
Sulfuric acid, Zinc salt (1:1)	Bluegill	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1972. Sparks, R.E., J.,Jr. Cairns, and A.G. Heath. The Use of Bluegill Breathing Rates to Detect Zinc. Water Res.6(8): 895-911.
Zinc	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	1970	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Zinc	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	2630	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Zinc	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	27380	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Zinc	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	79980	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Zinc	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	1360	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	1860	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Zinc	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	21600	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Zinc	Bony Fishes	Fish	Fresh	Mortality	LC50	Not Reported	T	57590	NA	NR	ug/L	LAB	1988. Ismail, P.. Influence of Salinity on the Toxicity of Zinc and Copper to Guppy. Malays. Appl. Biol.17(1): 31-38.
Zinc	Bony Fishes	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	0.00015	NA	NR	molal	LAB	1965. Ishio, S.. Behavior of Fish Exposed to Toxic Substances. In: O.Jaag (Ed.), Advances in Water Pollution Research, Pergamon Press, NY: 19-40.
Zinc chloride (ZnCl2)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	23000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Zinc chloride (ZnCl2)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	4800	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Zinc chloride (ZnCl2)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	5350	NA	NR	ug/L	LAB	1996. Buhl, K.J., and S.J. Hamilton. Toxicity of Inorganic Contaminants, Individually and in Environmental Mixtures, to Three Endangered Fishes (Colorado Squawfish, Bonytail, and Razorback Sucker). Arch. Environ. Contam. Toxicol.30(1): 84-92.
Zinc chloride (ZnCl2)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	5800	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Zinc chloride (ZnCl2)	Bonytail	Fish	Fresh	Mortality	LC50	Not Reported	T	8010	NA	NR	ug/L	LAB	1996. Buhl, K.J., and S.J. Hamilton. Toxicity of Inorganic Contaminants, Individually and in Environmental Mixtures, to Three Endangered Fishes (Colorado Squawfish, Bonytail, and Razorback Sucker). Arch. Environ. Contam. Toxicol.30(1): 84-92.
Sulfuric acid, Zinc salt (1:1)	Bream	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Bream	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Bream	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Bream	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Bream	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Bream	Fish	Fresh	Mortality	LC50	Not Reported	T	14300	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Bream	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Growth	IC25	Whole Organism	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Zinc	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	960	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Zinc	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	960	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1550	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1570	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1570	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	1440	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	1550	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	2420	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	4980	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	6140	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	6980	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1360	NA	NR	ug/L	LAB	1979. Holcombe, G.W., D.A. Benoit, and E.N. Leonard. Long-Term Effects of Zinc Exposures on Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.108(1): 76-87.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1368	NA	NR	ug/L	LAB	1979. Holcombe, G.W., D.A. Benoit, and E.N. Leonard. Long-Term Effects of Zinc Exposures on Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.108(1): 76-87.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1368	NA	NR	ug/L	LAB	1979. Holcombe, G.W., D.A. Benoit, and E.N. Leonard. Long-Term Effects of Zinc Exposures on Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.108(1): 76-87.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	724	NA	NR	ug/L	LAB	1979. Holcombe, G.W., D.A. Benoit, and E.N. Leonard. Long-Term Effects of Zinc Exposures on Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.108(1): 76-87.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	724	NA	NR	ug/L	LAB	1979. Holcombe, G.W., D.A. Benoit, and E.N. Leonard. Long-Term Effects of Zinc Exposures on Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.108(1): 76-87.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1368	NA	NR	ug/L	LAB	1979. Holcombe, G.W., D.A. Benoit, and E.N. Leonard. Long-Term Effects of Zinc Exposures on Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.108(1): 76-87.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1368	NA	NR	ug/L	LAB	1979. Holcombe, G.W., D.A. Benoit, and E.N. Leonard. Long-Term Effects of Zinc Exposures on Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.108(1): 76-87.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2058	NA	NR	ug/L	LAB	1979. Holcombe, G.W., D.A. Benoit, and E.N. Leonard. Long-Term Effects of Zinc Exposures on Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.108(1): 76-87.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR	Not Reported	T	724	NA	NR	ug/L	LAB	1979. Holcombe, G.W., D.A. Benoit, and E.N. Leonard. Long-Term Effects of Zinc Exposures on Brook Trout (Salvelinus fontinalis). Trans. Am. Fish. Soc.108(1): 76-87.
Sulfuric acid, Zinc salt (1:1)	Brook Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Zinc chloride (ZnCl2)	Brown Bullhead	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	12000		NC	ug/L	LAB	1961. Joyner, T.. Exchange of Zinc with Environmental Solutions by the Brown Bullhead. Trans. Am. Fish. Soc.90: 444-448.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	640	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	640	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1000		NC	ug/L	LAB	1989. Everall, N.C., N.A.A. MacFarlane, and R.W. Sedgwick. The Interactions of Water Hardness and pH with the Acute Toxicity of Zinc to the Brown Trout, Salmo trutta L.. J. Fish Biol.35(1): 27-36.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1070		NC	ug/L	LAB	1989. Everall, N.C., N.A.A. MacFarlane, and R.W. Sedgwick. The Interactions of Water Hardness and pH with the Acute Toxicity of Zinc to the Brown Trout, Salmo trutta L.. J. Fish Biol.35(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1410		NC	ug/L	LAB	1989. Everall, N.C., N.A.A. MacFarlane, and R.W. Sedgwick. The Interactions of Water Hardness and pH with the Acute Toxicity of Zinc to the Brown Trout, Salmo trutta L.. J. Fish Biol.35(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2020		NC	ug/L	LAB	1989. Everall, N.C., N.A.A. MacFarlane, and R.W. Sedgwick. The Interactions of Water Hardness and pH with the Acute Toxicity of Zinc to the Brown Trout, Salmo trutta L.. J. Fish Biol.35(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	220		NC	ug/L	LAB	1989. Everall, N.C., N.A.A. MacFarlane, and R.W. Sedgwick. The Interactions of Water Hardness and pH with the Acute Toxicity of Zinc to the Brown Trout, Salmo trutta L.. J. Fish Biol.35(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2310		NC	ug/L	LAB	1989. Everall, N.C., N.A.A. MacFarlane, and R.W. Sedgwick. The Interactions of Water Hardness and pH with the Acute Toxicity of Zinc to the Brown Trout, Salmo trutta L.. J. Fish Biol.35(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2690		NC	ug/L	LAB	1989. Everall, N.C., N.A.A. MacFarlane, and R.W. Sedgwick. The Interactions of Water Hardness and pH with the Acute Toxicity of Zinc to the Brown Trout, Salmo trutta L.. J. Fish Biol.35(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3200		NC	ug/L	LAB	1989. Everall, N.C., N.A.A. MacFarlane, and R.W. Sedgwick. The Interactions of Water Hardness and pH with the Acute Toxicity of Zinc to the Brown Trout, Salmo trutta L.. J. Fish Biol.35(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	460		NC	ug/L	LAB	1989. Everall, N.C., N.A.A. MacFarlane, and R.W. Sedgwick. The Interactions of Water Hardness and pH with the Acute Toxicity of Zinc to the Brown Trout, Salmo trutta L.. J. Fish Biol.35(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	600		NC	ug/L	LAB	1989. Everall, N.C., N.A.A. MacFarlane, and R.W. Sedgwick. The Interactions of Water Hardness and pH with the Acute Toxicity of Zinc to the Brown Trout, Salmo trutta L.. J. Fish Biol.35(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	640		NC	ug/L	LAB	1989. Everall, N.C., N.A.A. MacFarlane, and R.W. Sedgwick. The Interactions of Water Hardness and pH with the Acute Toxicity of Zinc to the Brown Trout, Salmo trutta L.. J. Fish Biol.35(1): 27-36.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1250		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1250		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1250		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	550		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	642		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	660		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	645		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	645		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	645		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	457		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	457		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	457		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	324		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	324		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	324		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1966. Grande, M.. Effect of Copper and Zinc on Salmonid Fishes. Adv. Water Pollut. Res.3(1): 97-111.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1966. Grande, M.. Effect of Copper and Zinc on Salmonid Fishes. Adv. Water Pollut. Res.3(1): 97-111.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc nitrate	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Effects of Six Trace Metals on Calcium Fluxes in Brown Trout (Salmo trutta L.) in Soft Water. J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.: 537-542.
Zinc nitrate	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	nmol/L	LAB	1989. Sayer, M.D.J., J.P. Reader, and R. Morris. The Effect of Calcium Concentration on the Toxicity of Copper, Lead and Zinc to Yolk-Sac Fry of Brown Trout, Salmo trutta L., in Soft, Acid Water. J. Fish Biol.35(3): 323-332.
Zinc nitrate	Brown Trout	Fish	Fresh	Mortality	NR	Not Reported	T	300	NR	NR	nmol/L	LAB	1991. Sayer, M.D.J., J.P. Reader, and R. Morris. Embryonic and Larval Development of Brown Trout, Salmo trutta L.: Exposure to Trace Metal Mixtures in Soft Water. J. Fish Biol.38: 773-787.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1283		NC	ug/L	LAB	1994. Davies, P.H., and S. Brinkman. Water Pollution Studies. Fed.Aid Proj.#F-33, Colorado Div.of Wildl., Fish Res.Sect., Fort Collins, CO: 138 p..
Zinc	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	230	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Sulfuric acid, Zinc salt (1:1)	Brown Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1700	NR	NR	ug/L	LAB	1999. Sanchez-Galan, S., A.R. Linde, and E. Garcia-Vazquez. Brown Trout and European Minnow as Target Species for Genotoxicity Tests: Differential Sensitivity to Heavy Metals. Ecotoxicol. Environ. Saf.43(3): 301-304.
Zinc chloride (ZnCl2)	Brown Trout	Fish	Fresh	Reproduction	LOEC	Sperm	T	75000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Zinc chloride (ZnCl2)	Brown Trout	Fish	Fresh	Reproduction	LOEC	Sperm	T	75000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Zinc chloride (ZnCl2)	Brown Trout	Fish	Fresh	Reproduction	LOEC	Sperm	T	75000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	165	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	178	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	196	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	233	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	277	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	30.1	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	307	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	31.9	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	35.6	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	38.1	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	395	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	438	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	52.7	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	59.1	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Bull Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	86.9	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Burbot	Fish	Fresh	Reproduction	LOEC	Sperm	T	75000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Zinc chloride (ZnCl2)	Burbot	Fish	Fresh	Reproduction	LOEC	Sperm	T	75000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Zinc chloride (ZnCl2)	Burbot	Fish	Fresh	Reproduction	NOEC	Sperm	T	75000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Zinc	Carp	Fish	Fresh	Growth	NR	Not Reported	T	400	NA	NR	ug/L	LAB	1990. Moni, D., P. Baskaran, and S. Palanichamy. Influence of Water Hardness and Heavy Metal (Zinc) on Food Utilization in Cyprinus carpio Var. Communis. J.Ecobiol.2(1): 51-55.
Sulfuric acid, Zinc salt (1:1)	Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	63400	NR	NR	ug/L	LAB	1982. Kapur, K., and N.A. Yadav. The Effects of Certain Heavy Metal Salts on the Development of Eggs in Common Carp, Cyprinus carpio var. communis. Acta Hydrochim. Hydrobiol.10(5): 517-522.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Growth	MATC	Not Reported	T	320	NA	NR	ug/L	LAB	1995. Sharma, A., and M.S. Sharma. Acute Toxicity of Zinc to Certain Developmental Stages of Cirrhinus mrigala (Hamilton). J. Environ. Biol.16(2): 157-162.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Growth	MATC	Not Reported	T	320	NA	NR	ug/L	LAB	1995. Sharma, A., and M.S. Sharma. Acute Toxicity of Zinc to Certain Developmental Stages of Cirrhinus mrigala (Hamilton). J. Environ. Biol.16(2): 157-162.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Growth	MATC	Not Reported	T	3200	NA	NR	ug/L	LAB	1995. Sharma, A., and M.S. Sharma. Acute Toxicity of Zinc to Certain Developmental Stages of Cirrhinus mrigala (Hamilton). J. Environ. Biol.16(2): 157-162.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	5.92		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	5.44		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	3.96		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	3.68		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	3.48		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	3		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	2.6		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	2.36		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	2.24		NC	ug/L	LAB	1993. Sithanand, T., and S.S.M. Das. Studies on the Toxicity of Copper, Zinc and Copper-Zinc Mixture on Cirrhina mrigala (Hamilton). Uttar Pradesh J. Zool.13(1): 52-54.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1995. Sharma, A., and M.S. Sharma. Acute Toxicity of Zinc to Certain Developmental Stages of Cirrhinus mrigala (Hamilton). J. Environ. Biol.16(2): 157-162.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	35000	NA	NR	ug/L	LAB	1995. Sharma, A., and M.S. Sharma. Acute Toxicity of Zinc to Certain Developmental Stages of Cirrhinus mrigala (Hamilton). J. Environ. Biol.16(2): 157-162.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1995. Sharma, A., and M.S. Sharma. Acute Toxicity of Zinc to Certain Developmental Stages of Cirrhinus mrigala (Hamilton). J. Environ. Biol.16(2): 157-162.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	12800	NA	NR	ug/L	LAB	1984. Verma, S.R., I.P. Tonk, A.K. Gupta, and M. Saxena. Evaluation of an Application Factor for Determining the Safe Concentration of Agricultural and Industrial Chemicals. Water Res.18(1): 111-115.
Zinc	Carp, Hawk Fish	Fish	NR	Mortality	LC50	Not Reported	T	1826	NA	NR	ug/L	LAB	1994. Gupta, A.K., and S.K. Sharma. Bioaccumulation of Zinc in Cirrhinus mrigala (Hamilton) Fingerlings During Short-Term Static Bioassay. J. Environ. Biol.15(3): 231-237.
Zinc	Carp, Hawk Fish	Fish	NR	Mortality	LC50	Not Reported	T	1787	NA	NR	ug/L	LAB	1994. Gupta, A.K., and S.K. Sharma. Bioaccumulation of Zinc in Cirrhinus mrigala (Hamilton) Fingerlings During Short-Term Static Bioassay. J. Environ. Biol.15(3): 231-237.
Zinc	Carp, Hawk Fish	Fish	NR	Mortality	LC50	Not Reported	T	1673	NA	NR	ug/L	LAB	1994. Gupta, A.K., and S.K. Sharma. Bioaccumulation of Zinc in Cirrhinus mrigala (Hamilton) Fingerlings During Short-Term Static Bioassay. J. Environ. Biol.15(3): 231-237.
Zinc	Carp, Hawk Fish	Fish	NR	Mortality	LC50	Not Reported	T	1633	NA	NR	ug/L	LAB	1994. Gupta, A.K., and S.K. Sharma. Bioaccumulation of Zinc in Cirrhinus mrigala (Hamilton) Fingerlings During Short-Term Static Bioassay. J. Environ. Biol.15(3): 231-237.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. Verma, S.R., I.P. Tonk, A.K. Gupta, and M. Saxena. Evaluation of an Application Factor for Determining the Safe Concentration of Agricultural and Industrial Chemicals. Water Res.18(1): 111-115.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Sharma, A., and M.S. Sharma. Acute Toxicity of Zinc to Certain Developmental Stages of Cirrhinus mrigala (Hamilton). J. Environ. Biol.16(2): 157-162.
Sulfuric acid, Zinc salt (1:1)	Carp, Hawk Fish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3200	NA	NR	ug/L	LAB	1995. Sharma, A., and M.S. Sharma. Acute Toxicity of Zinc to Certain Developmental Stages of Cirrhinus mrigala (Hamilton). J. Environ. Biol.16(2): 157-162.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	41000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	56000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	58000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	68000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	37000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	52000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	52000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	60000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	33000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	43000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	46000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	58000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	13240	NA	NR	ug/L	LAB	1991. Annune, P.A., A.A. Oladimeji, and S. Ebele. Acute Toxicity of Zinc to the Fingerlings of Clarias lazera Cuvier and Valenciennes and Oreochromis niloticus (Trewavas). J. Aquat. Sci.6: 19-22.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	26000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	38000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	40000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	52000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	210		NC	ug/L	LAB	2003. Oronsaye, J.A.O., N.F. Okolo, and E.E. Obano. The Toxicity of Zinc and Cadmium to Clarias submaginatus. J. Aquat. Sci.18(1): 65-69.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	760		NC	ug/L	LAB	2003. Oronsaye, J.A.O., N.F. Okolo, and E.E. Obano. The Toxicity of Zinc and Cadmium to Clarias submaginatus. J. Aquat. Sci.18(1): 65-69.
Sulfuric acid, Zinc salt (1:1)	Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	530		NC	ug/L	LAB	2003. Oronsaye, J.A.O., N.F. Okolo, and E.E. Obano. The Toxicity of Zinc and Cadmium to Clarias submaginatus. J. Aquat. Sci.18(1): 65-69.
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	6600	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	3900	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	3900	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	3900	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	3900	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	3900	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	3900	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	3900	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Chanda Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	3900	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NOEC	Not Reported	T	200000		NC	ug/L	LAB	1989. Gatlin III, D.M., H.F. Phillips, and E.L. Torrans. Effects of Various Levels of Dietary Copper and Zinc on Channel Catfish. Aquaculture76(1-2): 127-134.
Sulfuric acid, Zinc salt (1:1)	Channel Catfish	Fish	Fresh	Growth	NOEL	Whole Organism	T	100000		NC	ug/L	LAB	1983. Gatlin III, D.M., and R.P. Wilson. Dietary Zinc Requirement of Fingerling Channel Catfish. J. Nutr.113: 630-635.
Sulfuric acid, Zinc salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	LC50	Not Reported	D	8600	NA	NR	ug/L	LAB	1980. Reed, P., D. Richey, and D. Roseboom. Acute Toxicity of Zinc to Some Fishes in high Alkalinity Water. Ill. State Water Surv. Circ.142: 1-21.
Sulfuric acid, Zinc salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1983. Gatlin III, D.M., and R.P. Wilson. Dietary Zinc Requirement of Fingerling Channel Catfish. J. Nutr.113: 630-635.
Zinc chloride (ZnCl2)	Channel Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	0.0001	NA	NR	M	LAB	1992. Bentley, P.J.. Influx of Zinc by Channel Catfish (Ictalurus punctatus): Uptake from External Environmental Solutions. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.101(2): 215-217.
Sulfuric acid, Zinc salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	12000	NA	NR	ug/L	LAB	1971. Lewis, S.D., and W.M. Lewis. The Effect of Zinc and Copper on the Osmolality of Blood Serum of the Channel Catfish, Ictalurus punctatus Rafinesque, and Golden Shiner, Notemigonus crysoleucas Mitchill. Trans. Am. Fish. Soc.100(4): 639-643.
Sulfuric acid, Zinc salt (1:1)	Channel Catfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	200000		NC	ug/L	LAB	1989. Gatlin III, D.M., H.F. Phillips, and E.L. Torrans. Effects of Various Levels of Dietary Copper and Zinc on Channel Catfish. Aquaculture76(1-2): 127-134.
Sulfuric acid, Zinc salt (1:1)	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	1470*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Sulfuric acid, Zinc salt (1:1)	Channelfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	1100*	NA	NR	ug/L	LAB	1986. Abbasi, S.A., and R. Soni. An Examination of Environmentally Safe Levels of Zinc (II), Cadmium (II) and Lead (II) with Reference to Impact on Channelfish Nuria denricus. Environ. Pollut. A.40(1): 37-51.
Sulfuric acid, Zinc salt (1:1)	Characin	Fish	Fresh	Mortality	LC50	Not Reported	T	23600		NC	ug/L	LAB	2007. Gioda, C.R., L.A. Lissner, A. Pretto, J.B.T. Da Rocha, M.R.C. Schetinger, J.R. Neto, V.M. Morsch, and V.L. Loro. Exposure to Sublethal Concentrations of Zn(II) and Cu(II) Changes Biochemical Parameters in Leporinus obtusidens. Chemosphere69(1): 170-175.
Sulfuric acid, Zinc salt (1:1)	Characin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	4600		NC	ug/L	LAB	2007. Gioda, C.R., L.A. Lissner, A. Pretto, J.B.T. Da Rocha, M.R.C. Schetinger, J.R. Neto, V.M. Morsch, and V.L. Loro. Exposure to Sublethal Concentrations of Zn(II) and Cu(II) Changes Biochemical Parameters in Leporinus obtusidens. Chemosphere69(1): 170-175.
Sulfuric acid, Zinc salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	4730	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid, Zinc salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	4800	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid, Zinc salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	6140	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Checkered Rainbow Fish	Fish	Fresh	Mortality	LC50	Not Reported	T	6200	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Zinc	Chinook Salmon	Fish	Fresh	Growth	LOEC	Not Reported	D	49	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Zinc	Chinook Salmon	Fish	Fresh	Growth	NOEC	Not Reported	D	500	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Sulfuric acid, Zinc salt (1:1)	Chinook Salmon	Fish	Fresh	Growth	NR		T	150*	NA	NR	ug/L	LAB	1973. Negilski, D.S.. Individual and Combined Effects of Cyanide, Pentachlorophenol and Zinc on Juvenile Chinook Salmon and Invertebrates in Model Stream Communities. M.S.Thesis, Oregon State Univ., Corvallis, OR: 80 p..
Zinc	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	182	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Zinc chloride (ZnCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	12600	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Zinc chloride (ZnCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	5530	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Zinc chloride (ZnCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	463	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	701	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	97	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1270	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Zinc chloride (ZnCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	2880	NA	NR	ug/L	LAB	1990. Hamilton, S.J., and K.J. Buhl. Safety Assessment of Selected Inorganic Elements to Fry of Chinook Salmon (Oncorhynchus tshawytscha). Ecotoxicol. Environ. Saf.20(3): 307-324.
Zinc chloride (ZnCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	364	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	395	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	97	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Sulfuric acid, Zinc salt (1:1)	Chinook Salmon	Fish	Fresh	Mortality	LC50	Not Reported	D	84	NA	NR	ug/L	LAB	1982. Finlayson, B.J., and K.M. Verrue. Toxicities of Copper, Zinc, and Cadmium Mixtures to Juvenile Chinook Salmon. Trans. Am. Fish. Soc.111(5): 645-650.
Zinc	Chinook Salmon	Fish	Fresh	Mortality	LOEC	Not Reported	D	500	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Zinc	Chinook Salmon	Fish	Fresh	Mortality	NOEC	Not Reported	D	280	NR	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Zinc chloride (ZnCl2)	Chub	Fish	Fresh	Reproduction	LOEC	Sperm	T	7500	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Zinc chloride (ZnCl2)	Chub	Fish	Fresh	Reproduction	NOEC	Sperm	T	7500	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Zinc chloride (ZnCl2)	Chub	Fish	Fresh	Reproduction	NOEC	Sperm	T	7500	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid, Zinc salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC10	Not Reported	T	2700		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid, Zinc salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid, Zinc salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid, Zinc salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid, Zinc salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid, Zinc salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid, Zinc salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	4000		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid, Zinc salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Sulfuric acid, Zinc salt (1:1)	Cichlid	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2004. Bulus Rossini, G.D., and A.E. Ronco. Sensitivity of Cichlasoma facetum (Cichlidae, Pisces) to Metals. Bull. Environ. Contam. Toxicol.72(4): 763-768.
Zinc chloride (ZnCl2)	Climbing Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	260000*	NA	NR	ug/L	LAB	1988. Banerjee, V., and K. Kumari. Effect of Zinc, Mercury and Cadmium on Erythrocyte and Related Parameters in the Fish Anabas testudineus. Environ. Ecol.6(3): 737-739.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	NR	Growth	LOEL	Whole Organism	T	1900000		NC	ug/L	LAB	2006. Bowen, L., I. Werner, and M.L. Johnson. Physiological and Behavioral Effects of Zinc and Temperature on Coho Salmon (Oncorhynchus kisutch). Hydrobiologia559(1): 161-168.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	NR	Growth	LOEL	Whole Organism	T	1900000		NC	ug/L	LAB	2006. Bowen, L., I. Werner, and M.L. Johnson. Physiological and Behavioral Effects of Zinc and Temperature on Coho Salmon (Oncorhynchus kisutch). Hydrobiologia559(1): 161-168.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	NR	Growth	LOEL	Whole Organism	T	1900000		NC	ug/L	LAB	2006. Bowen, L., I. Werner, and M.L. Johnson. Physiological and Behavioral Effects of Zinc and Temperature on Coho Salmon (Oncorhynchus kisutch). Hydrobiologia559(1): 161-168.
Zinc chloride (ZnCl2)	Salmon,Silver S	Fish	NR	Growth	LOEL	Whole Organism	T	1900000		NC	ug/L	LAB	2006. Bowen, L., I. Werner, and M.L. Johnson. Physiological and Behavioral Effects of Zinc and Temperature on Coho Salmon (Oncorhynchus kisutch). Hydrobiologia559(1): 161-168.
Zinc chloride (ZnCl2)	Salmon,Silver S	Fish	Fresh	Mortality	LC50	Not Reported	T	1320		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Salmon,Silver S	Fish	Fresh	Mortality	LC50	Not Reported	T	1730		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Salmon,Silver S	Fish	Fresh	Mortality	LC50	Not Reported	T	2190		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Salmon,Silver S	Fish	Fresh	Mortality	LC50	Not Reported	T	2790		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Salmon,Silver S	Fish	Fresh	Mortality	LC50	Not Reported	T	3380		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Salmon,Silver S	Fish	Fresh	Mortality	LC50	Not Reported	T	3530		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	400		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	6040		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Hedtke, J.L., E. Robinson-Wilson, and L.J. Weber. Influence of Body Size and Developmental Stage of Coho Salmon (Oncorhynchus kisutch) on Lethality of Several Toxicants. Fundam. Appl. Toxicol.2: 67-72.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	2850	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	3140	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	5610	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	5610	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	905	NR	NR	ug/L	LAB	1978. Chapman, G.A., and D.G. Stevens. Acutely Lethal Levels of Cadmium, Copper, and Zinc to Adult Male Coho Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 837-840.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	4600	NA	NR	ug/L	LAB	1977. Lorz, H.W., and B.P. McPherson. Effects of Copper and Zinc on Smoltification of Coho Salmon. EPA-600/3-77-032, U.S.EPA, Corvallis, OR: 69 p..
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1975. Chapman, G.A.. Toxicity of Copper, Cadmium, and Zinc to Pacific Northwest Salmonids. Interim Report, Task 002 ROAP 10CAR, U.S.EPA, Corvallis, OR: 27 p..
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	4600	NA	NR	ug/L	LAB	1976. Lorz, H.W., and B.P. McPherson. Effects of Copper or Zinc in Fresh Water or the Adaptation to Sea Water and ATPase Activity and the Effects of Copper on Migratory Disposition of Coho Salmon (Oncorhynchus kisutch). J. Fish. Res. Board Can.33(9): 2023-2030.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1650	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	1810	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	727	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	820	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	4200	NA	NR	ug/L	LAB	1977. Lorz, H.W., and B.P. McPherson. Effects of Copper and Zinc on Smoltification of Coho Salmon. EPA-600/3-77-032, U.S.EPA, Corvallis, OR: 69 p..
Sulfuric acid, Zinc salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1978. British, Columbia Research. Avoidance Reactions of Salmonids to Pulpmill Effluents. Environ.Can., Environ.Prot.Serv., Coop.Pollut.Abatement Res., CPAR Project Rep.688-1: 36.
Sulfuric acid, Zinc salt (1:1)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	870	NA	NR	ug/L	LAB	1978. British, Columbia Research. Avoidance Reactions of Salmonids to Pulpmill Effluents. Environ.Can., Environ.Prot.Serv., Coop.Pollut.Abatement Res., CPAR Project Rep.688-1: 36.
Zinc chloride (ZnCl2)	Coho Salmon,Silver Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	2027	NA	NR	ug/L	LAB	1978. Lorz, H.W., R.H. Williams, and C.A. Fustish. Effects of Several Metals on Smolting of Coho Salmon. EPA-600/3-78-090, U.S.EPA, Corvallis, OR: 84 p..
Zinc chloride (ZnCl2)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Zinc chloride (ZnCl2)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1700	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Zinc chloride (ZnCl2)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3340	NA	NR	ug/L	LAB	1996. Buhl, K.J., and S.J. Hamilton. Toxicity of Inorganic Contaminants, Individually and in Environmental Mixtures, to Three Endangered Fishes (Colorado Squawfish, Bonytail, and Razorback Sucker). Arch. Environ. Contam. Toxicol.30(1): 84-92.
Zinc chloride (ZnCl2)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Zinc chloride (ZnCl2)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8620	NA	NR	ug/L	LAB	1996. Buhl, K.J., and S.J. Hamilton. Toxicity of Inorganic Contaminants, Individually and in Environmental Mixtures, to Three Endangered Fishes (Colorado Squawfish, Bonytail, and Razorback Sucker). Arch. Environ. Contam. Toxicol.30(1): 84-92.
Sulfuric acid, Zinc salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid, Zinc salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid, Zinc salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid, Zinc salt (1:1)	Colorado Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Growth	NR		T	1100	NA	NR	ug/L	LAB	1977. Sabodash, V.M.. Size of Eggs and Ovule of Female Carp of Various Age, Both Under Normal Conditions and Exposed to Increase Doses of Zinc Sulfate. Biol. Nauki (Mosc.)20(3): 62-67.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Growth	NR		T	17000	NA	NR	ug/L	LAB	1981. Jeng, S.S., and L.T. Sun. Effects of Dietary Zinc Levels on Zinc Concentrations in Tissues of Common Carp. J. Nutr.111: 134-140.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Growth	NR		T	294000	NA	NR	ug/L	LAB	1981. Jeng, S.S., and L.T. Sun. Effects of Dietary Zinc Levels on Zinc Concentrations in Tissues of Common Carp. J. Nutr.111: 134-140.
Zinc	Common Carp	Fish	Fresh	Mortality	LC5	Not Reported	T	4200	NR	NR	ug/L	LAB	1986. Wani, G.P.. Toxicity of Heavy Metals to Embryonic Stages of Cyprinus carpio communis Linn. Pollut. Res.5(2): 47-51.
Zinc	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	23000		NC	ug/L	LAB	1998. Lam, K.L., P.W. Ko, J.K.Y. Wong, and K.M. Chan. Metal Toxicity and Metallothionein Gene Expression Studies in Common Carp and Tilapia. Mar. Environ. Res.46(1-5): 563-566.
Zinc	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	17000		NC	ug/L	LAB	1998. Lam, K.L., P.W. Ko, J.K.Y. Wong, and K.M. Chan. Metal Toxicity and Metallothionein Gene Expression Studies in Common Carp and Tilapia. Mar. Environ. Res.46(1-5): 563-566.
Zinc	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	14400	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	9200	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	30000	NA	NR	ug/L	LAB	1993. Radhakrishnaiah, K., A. Suresh, and B. Sivaramakrishna. Effect of Sublethal Concentration of Mercury and Zinc on the Energistics of a Freshwater Fish Cyprinus carpio (Linnaeus). Acta Biol. Hung.44(4): 375-385.
Zinc	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1340	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Zinc	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1640	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Zinc	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2250	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Zinc	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	450	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Zinc	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	7800	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	149		NC	umol/L	LAB	2006. Hattink, J., G. De Boeck, and R. Blust. Toxicity, Accumulation, and Retention of Zinc by Carp Under Normoxic and Hypoxic Conditions. Environ. Toxicol. Chem.25(1): 87-96.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	55		NC	umol/L	LAB	2006. Hattink, J., G. De Boeck, and R. Blust. Toxicity, Accumulation, and Retention of Zinc by Carp Under Normoxic and Hypoxic Conditions. Environ. Toxicol. Chem.25(1): 87-96.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1240	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1340	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1640	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1640	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1660	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	2250	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	450	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	830	NA	NR	ug/L	LAB	1992. Alam, M.K., and O.E. Maughan. The Effect of Malathion, Diazinon, and Various Concentrations of Zinc, Copper, Nickel, Lead, Iron, and Mercury on Fish. Biol. Trace Elem. Res.34(3): 225-236.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	6000		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	7000		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	1300		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	6900		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	10770	NA	NR	ug/L	LAB	1983. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and the Biosphere" -Studies on Sikkim Himalayas. Part 1: Acute Toxicity of Copper and Zinc to Common Carp Cyprinus carpio (Linn.) in Soft Water. Acta Hydrochim. Hydrobiol.11(6): 667-673.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	350*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	9040	NA	NR	ug/L	LAB	1983. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and the Biosphere" -Studies on Sikkim Himalayas. Part 1: Acute Toxicity of Copper and Zinc to Common Carp Cyprinus carpio (Linn.) in Soft Water. Acta Hydrochim. Hydrobiol.11(6): 667-673.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	36400	NA	NR	ug/L	LAB	1977. Tishinova, V.. A Study of the Toxic Effect of Zinc on One-Summer Old Carp; Part I. Lethal Concentrations. U.S.NTIS ORNL-TR-4353: 3 p..
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	9040	NA	NR	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 2: Acute Toxicity of Mixed Copper-Zinc Solutions on Common Carp, Cyprinus carpio (Linn.). Acta Hydrochim. Hydrobiol.12(2): 131-135.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	87500	NA	NR	ug/L	LAB	1990. Vykusova, B., and Z. Svobodova. Acute Toxicity of Standards to Fish (Akutni Toxicita Standardu pro Ryby). Bull. V. U. R. H. Vodnany26(3): 15-20.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	260*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	7280	NA	NR	ug/L	LAB	1983. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and the Biosphere" -Studies on Sikkim Himalayas. Part 1: Acute Toxicity of Copper and Zinc to Common Carp Cyprinus carpio (Linn.) in Soft Water. Acta Hydrochim. Hydrobiol.11(6): 667-673.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	7280	NA	NR	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 2: Acute Toxicity of Mixed Copper-Zinc Solutions on Common Carp, Cyprinus carpio (Linn.). Acta Hydrochim. Hydrobiol.12(2): 131-135.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	5560	NA	NR	ug/L	LAB	1983. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and the Biosphere" -Studies on Sikkim Himalayas. Part 1: Acute Toxicity of Copper and Zinc to Common Carp Cyprinus carpio (Linn.) in Soft Water. Acta Hydrochim. Hydrobiol.11(6): 667-673.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	150*	NA	NR	ug/L	LAB	1975. Rao, T.S., M.S. Rao, and S.B.S.K. Prasad. Median Tolerance Limits of Some Chemicals to the Fresh Water Fish "Cyprinus carpio". Indian J. Environ. Health17(2): 140-146.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	3120	NA	NR	ug/L	LAB	1983. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and the Biosphere" -Studies on Sikkim Himalayas. Part 1: Acute Toxicity of Copper and Zinc to Common Carp Cyprinus carpio (Linn.) in Soft Water. Acta Hydrochim. Hydrobiol.11(6): 667-673.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	LC50	Not Reported	T	21400	NA	NR	ug/L	LAB	1977. Tishinova, V.. A Study of the Toxic Effect of Zinc on One-Summer Old Carp; Part I. Lethal Concentrations. U.S.NTIS ORNL-TR-4353: 3 p..
Zinc nitrate	Common Carp	Fish	Fresh	Mortality	LC50*	Not Reported	T	14300	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	Common Carp	Fish	Fresh	Mortality	LC50*	Not Reported	T	9300	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	Common Carp	Fish	Fresh	Mortality	LC50*	Not Reported	T	7800	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	NOEC	Not Reported	T	35		NC	umol/L	LAB	2006. Hattink, J., G. De Boeck, and R. Blust. Toxicity, Accumulation, and Retention of Zinc by Carp Under Normoxic and Hypoxic Conditions. Environ. Toxicol. Chem.25(1): 87-96.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	NOEC	Not Reported	T	49		NC	umol/L	LAB	2006. Hattink, J., G. De Boeck, and R. Blust. Toxicity, Accumulation, and Retention of Zinc by Carp Under Normoxic and Hypoxic Conditions. Environ. Toxicol. Chem.25(1): 87-96.
Zinc	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	16500	NA	NR	ug/L	LAB	1993. Sharma, A., and M.S. Sharma. Vertebral Defects in Lebistes reticulatus (Peters) and Cyprinus carpio (Linnaeus) Exposed to Heavy Metals. Pollut. Res.12(3): 139-143.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Wong, M.H., K.C. Luk, and K.Y. Choi. The Effects of Zinc and Copper Salts on Cyprinus carpio and Ctenopharyngodon idellus. Acta Anat.99(4): 450-454.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR	Not Reported	T		NR	NR	ug/L	LAB	1986. Wani, G.P.. Toxicity of Heavy Metals to Embryonic Stages of Cyprinus carpio communis Linn. Pollut. Res.5(2): 47-51.
Zinc	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Zinc	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3000	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3500	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500000		NC	ug/L	LAB	2000. Chyb, J., D.E. Kime, T. Mikolajczyk, P. Szczerbik, and P. Epler. The Influence of Zinc on Sperm Motility of Common Carp - a Computer Assisted Studies. Arch. Ryb. Pol. (Arch. Pol. Fish.)8(1): 5-14.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	100		NC	umol/L	LAB	2006. Hattink, J., G. De Boeck, and R. Blust. Toxicity, Accumulation, and Retention of Zinc by Carp Under Normoxic and Hypoxic Conditions. Environ. Toxicol. Chem.25(1): 87-96.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8320		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Zinc	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	100	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Zinc	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	500	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Zinc	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	500	NR	NR	ug/L	LAB	1995. Alam, M.K., and O.E. Maughan. Acute Toxicity of Heavy Metals to Common Carp (Cyprinus carpio). J. Environ. Sci. Health. Part A, Environ. Sci. Eng. Toxic Hazard. Substance Control30(8): 1807-1816.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	80		NC	ug/L	LAB	2001. Dhanapakiam, P., and V.K. Ramasamy. Toxic Effects of Copper and Zinc Mixtures on Some Haematological and Biochemical Parameters in Common Carp, Cyprinus carpio (Linn.). J. Environ. Biol.22(2): 105-111.
Sulfuric acid, Zinc salt (1:1)	Common Carp	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1040		NC	ug/L	LAB	1987. Kaur, K., and K. Bajwa. Effect of Zinc and Cadmium on Early Life Stages of Common Carp, Cyprinus carpio Linn.. Ann. Biol.3(2): 28-33.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2000. Chyb, J., D.E. Kime, T. Mikolajczyk, P. Szczerbik, and P. Epler. The Influence of Zinc on Sperm Motility of Common Carp - a Computer Assisted Studies. Arch. Ryb. Pol. (Arch. Pol. Fish.)8(1): 5-14.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Reproduction	LOEC	Not Reported	T	10000		NC	ug/L	LAB	2000. Chyb, J., D.E. Kime, T. Mikolajczyk, P. Szczerbik, and P. Epler. The Influence of Zinc on Sperm Motility of Common Carp - a Computer Assisted Studies. Arch. Ryb. Pol. (Arch. Pol. Fish.)8(1): 5-14.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Reproduction	LOEC	Not Reported	T	100000		NC	ug/L	LAB	2000. Chyb, J., D.E. Kime, T. Mikolajczyk, P. Szczerbik, and P. Epler. The Influence of Zinc on Sperm Motility of Common Carp - a Computer Assisted Studies. Arch. Ryb. Pol. (Arch. Pol. Fish.)8(1): 5-14.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Reproduction	LOEC	Not Reported	T	50000		NC	ug/L	LAB	2000. Chyb, J., D.E. Kime, T. Mikolajczyk, P. Szczerbik, and P. Epler. The Influence of Zinc on Sperm Motility of Common Carp - a Computer Assisted Studies. Arch. Ryb. Pol. (Arch. Pol. Fish.)8(1): 5-14.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2000. Chyb, J., D.E. Kime, T. Mikolajczyk, P. Szczerbik, and P. Epler. The Influence of Zinc on Sperm Motility of Common Carp - a Computer Assisted Studies. Arch. Ryb. Pol. (Arch. Pol. Fish.)8(1): 5-14.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Reproduction	NOEC	Not Reported	T	10000		NC	ug/L	LAB	2000. Chyb, J., D.E. Kime, T. Mikolajczyk, P. Szczerbik, and P. Epler. The Influence of Zinc on Sperm Motility of Common Carp - a Computer Assisted Studies. Arch. Ryb. Pol. (Arch. Pol. Fish.)8(1): 5-14.
Zinc chloride (ZnCl2)	Common Carp	Fish	Fresh	Reproduction	NOEC	Not Reported	T	50000		NC	ug/L	LAB	2000. Chyb, J., D.E. Kime, T. Mikolajczyk, P. Szczerbik, and P. Epler. The Influence of Zinc on Sperm Motility of Common Carp - a Computer Assisted Studies. Arch. Ryb. Pol. (Arch. Pol. Fish.)8(1): 5-14.
Sulfuric acid, Zinc salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	30000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	9600	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	9600	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	9600	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	9600	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	9600	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Common Jollytail	Fish	Fresh	Mortality	LC50	Not Reported	T	9600	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Zinc nitrate	Convict Or Zebra Cichlid	Fish	Fresh	Mortality	NR	Not Reported	T	16	NA	NR	ug/L	LAB	1979. Ozoh, P.T.E., and C.O. Jacobson. Embryotoxicity and Hatchability in Cichlasoma nigrofasciatum (Guenther) Eggs and Larvae Briefly Exposed to Low Concentrations of Zinc and Copper. Bull. Environ. Contam. Toxicol.21(6): 782-786.
Zinc nitrate	Convict Or Zebra Cichlid	Fish	Fresh	Mortality	NR	Not Reported	T	16	NA	NR	ug/L	LAB	1979. Ozoh, P.T.E., and C.O. Jacobson. Embryotoxicity and Hatchability in Cichlasoma nigrofasciatum (Guenther) Eggs and Larvae Briefly Exposed to Low Concentrations of Zinc and Copper. Bull. Environ. Contam. Toxicol.21(6): 782-786.
Zinc chloride (ZnCl2)	Crimson-Spotted Rainbowfish	Fish	NR	Mortality	LC50	Not Reported	T	1570		NC	ug/L	LAB	2000. Williams, N.D., and D.A. Holdway. The Effects of Pulse-Exposed Cadmium and Zinc on Embryo Hatchability, Larval Development, and Survival of Australian Crimson Spotted Rainbow Fish (Melanotaenia fluviatilis). Environ. Toxicol.15(3): 165-173.
Zinc chloride (ZnCl2)	Crimson-Spotted Rainbowfish	Fish	NR	Mortality	LC50	Not Reported	T	510		NC	ug/L	LAB	2000. Williams, N.D., and D.A. Holdway. The Effects of Pulse-Exposed Cadmium and Zinc on Embryo Hatchability, Larval Development, and Survival of Australian Crimson Spotted Rainbow Fish (Melanotaenia fluviatilis). Environ. Toxicol.15(3): 165-173.
Zinc chloride (ZnCl2)	Crimson-Spotted Rainbowfish	Fish	NR	Mortality	LC50	Not Reported	T	560		NC	ug/L	LAB	2000. Williams, N.D., and D.A. Holdway. The Effects of Pulse-Exposed Cadmium and Zinc on Embryo Hatchability, Larval Development, and Survival of Australian Crimson Spotted Rainbow Fish (Melanotaenia fluviatilis). Environ. Toxicol.15(3): 165-173.
Zinc chloride (ZnCl2)	Crimson-Spotted Rainbowfish	Fish	NR	Mortality	LC50	Not Reported	T	270		NC	ug/L	LAB	2000. Williams, N.D., and D.A. Holdway. The Effects of Pulse-Exposed Cadmium and Zinc on Embryo Hatchability, Larval Development, and Survival of Australian Crimson Spotted Rainbow Fish (Melanotaenia fluviatilis). Environ. Toxicol.15(3): 165-173.
Zinc chloride (ZnCl2)	Crimson-Spotted Rainbowfish	Fish	NR	Mortality	LOEL	Not Reported	T	3300		NC	ug/L	LAB	2000. Williams, N.D., and D.A. Holdway. The Effects of Pulse-Exposed Cadmium and Zinc on Embryo Hatchability, Larval Development, and Survival of Australian Crimson Spotted Rainbow Fish (Melanotaenia fluviatilis). Environ. Toxicol.15(3): 165-173.
Zinc chloride (ZnCl2)	Crimson-Spotted Rainbowfish	Fish	NR	Mortality	LOEL	Not Reported	T	33330		NC	ug/L	LAB	2000. Williams, N.D., and D.A. Holdway. The Effects of Pulse-Exposed Cadmium and Zinc on Embryo Hatchability, Larval Development, and Survival of Australian Crimson Spotted Rainbow Fish (Melanotaenia fluviatilis). Environ. Toxicol.15(3): 165-173.
Zinc chloride (ZnCl2)	Crimson-Spotted Rainbowfish	Fish	NR	Mortality	NOEL	Not Reported	T	33330		NC	ug/L	LAB	2000. Williams, N.D., and D.A. Holdway. The Effects of Pulse-Exposed Cadmium and Zinc on Embryo Hatchability, Larval Development, and Survival of Australian Crimson Spotted Rainbow Fish (Melanotaenia fluviatilis). Environ. Toxicol.15(3): 165-173.
Zinc chloride (ZnCl2)	Crimson-Spotted Rainbowfish	Fish	NR	Mortality	NOEL	Not Reported	T	10000		NC	ug/L	LAB	2000. Williams, N.D., and D.A. Holdway. The Effects of Pulse-Exposed Cadmium and Zinc on Embryo Hatchability, Larval Development, and Survival of Australian Crimson Spotted Rainbow Fish (Melanotaenia fluviatilis). Environ. Toxicol.15(3): 165-173.
Zinc chloride (ZnCl2)	Crimson-Spotted Rainbowfish	Fish	NR	Mortality	NOEL	Not Reported	T	1000		NC	ug/L	LAB	2000. Williams, N.D., and D.A. Holdway. The Effects of Pulse-Exposed Cadmium and Zinc on Embryo Hatchability, Larval Development, and Survival of Australian Crimson Spotted Rainbow Fish (Melanotaenia fluviatilis). Environ. Toxicol.15(3): 165-173.
Zinc	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	640	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Zinc	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	670	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	1000	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	147	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	240	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	68	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	100	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	130	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	152	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	600	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	61	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50	Not Reported	F	74	NR	NR	ug/L	LAB	1986. Mayer, F.L.,Jr., and M.R. Ellersieck. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. Resour.Publ.No.160, U.S.Dep.Interior, Fish Wildl.Serv., Washington, DC: 505 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	400	NA	NR	ug/L	LAB	1970. Rabe, F.W., and C.W. Sappington. Biological Productivity of the Coeur D'Alene River as Related to Water Quality (The Acute Toxicity of Zinc to Cutthroat Trout (Salmo clarki)). Res.Project Tech.Completion Rep., Project A-024-IDA, Water Resour.Res.Instit., University of Idaho: 16 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	620	NA	NR	ug/L	LAB	1970. Rabe, F.W., and C.W. Sappington. Biological Productivity of the Coeur D'Alene River as Related to Water Quality (The Acute Toxicity of Zinc to Cutthroat Trout (Salmo clarki)). Res.Project Tech.Completion Rep., Project A-024-IDA, Water Resour.Res.Instit., University of Idaho: 16 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	270	NA	NR	ug/L	LAB	1970. Rabe, F.W., and C.W. Sappington. Biological Productivity of the Coeur D'Alene River as Related to Water Quality (The Acute Toxicity of Zinc to Cutthroat Trout (Salmo clarki)). Res.Project Tech.Completion Rep., Project A-024-IDA, Water Resour.Res.Instit., University of Idaho: 16 p..
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	90	NA	NR	ug/L	LAB	1970. Rabe, F.W., and C.W. Sappington. Biological Productivity of the Coeur D'Alene River as Related to Water Quality (The Acute Toxicity of Zinc to Cutthroat Trout (Salmo clarki)). Res.Project Tech.Completion Rep., Project A-024-IDA, Water Resour.Res.Instit., University of Idaho: 16 p..
Zinc	Cutthroat Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	980	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Zinc	Cutthroat Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Zinc	Cutthroat Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	830	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Zinc	Cutthroat Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	850	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Sulfuric acid, Zinc salt (1:1)	Cutthroat Trout	Fish	Fresh	Reproduction	EC50	Not Reported	T	1010	NR	NR	ug/L	LAB	1998. Aquatic Toxicology Group. Brenda Mines Sulphate and Molybdenum Toxicity Testing. Proj.Rep.No.2-11-825/826, Prepared for Noranda Mining and Exploration Inc., Brenda Mines Div., B.C.: 222 p..
Sulfuric acid, Zinc salt (1:1)	Dace	Fish	NR	Mortality	LC50	Not Reported	T	14370		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Dace	Fish	NR	Mortality	LC50	Not Reported	T	11920		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Dace	Fish	NR	Mortality	LC50	Not Reported	T	10030		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Danio	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	T	11300	NR	NR	ug/L	LAB	1994. Singh, B.K., and S.P. Singh. Toxic Effects of Some Inorganic Salts on Testes of Fresh Water Fish Danio equipinatus (HAM). Proc. Acad. Environ. Biol.3(2): 241-244.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	600	NA	NR	ug/L	LAB	1988. Dawson, D.A., E.F. Stebler, S.L. Burks, and J.A. Bantle. Evaluation of the Developmental Toxicity of Metal-Contaminated Sediments Using Short-Term Fathead Minnow and Frog Embryo-Larval Assays. Environ. Toxicol. Chem.7(1): 27-34.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	EC50	Not Reported	T	800	NA	NR	ug/L	LAB	1988. Dawson, D.A., E.F. Stebler, S.L. Burks, and J.A. Bantle. Evaluation of the Developmental Toxicity of Metal-Contaminated Sediments Using Short-Term Fathead Minnow and Frog Embryo-Larval Assays. Environ. Toxicol. Chem.7(1): 27-34.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Whole Organism	T	1010		NC	ug/L	LAB	2003. Geis, S.W., K. Fleming, A. Mager, and L. Reynolds. Modifications to the Fathead Minnow (Pimephales promelas) Chronic Test Method to Remove Mortality due to Pathogenic Organisms. Environ. Toxicol. Chem.22(10): 2400-2404.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Whole Organism	T	910		NC	ug/L	LAB	2003. Geis, S.W., K. Fleming, A. Mager, and L. Reynolds. Modifications to the Fathead Minnow (Pimephales promelas) Chronic Test Method to Remove Mortality due to Pathogenic Organisms. Environ. Toxicol. Chem.22(10): 2400-2404.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	IC25	Whole Organism	T	181		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	250		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	546	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	271	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	535	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	270	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	565	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	615	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	271	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	285	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	600	NA	NR	ug/L	LAB	1988. Dawson, D.A., E.F. Stebler, S.L. Burks, and J.A. Bantle. Evaluation of the Developmental Toxicity of Metal-Contaminated Sediments Using Short-Term Fathead Minnow and Frog Embryo-Larval Assays. Environ. Toxicol. Chem.7(1): 27-34.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Not Reported	T	900	NA	NR	ug/L	LAB	1988. Dawson, D.A., E.F. Stebler, S.L. Burks, and J.A. Bantle. Evaluation of the Developmental Toxicity of Metal-Contaminated Sediments Using Short-Term Fathead Minnow and Frog Embryo-Larval Assays. Environ. Toxicol. Chem.7(1): 27-34.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	546	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	LOEC	Whole Organism	T	546	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Growth	LOEL	Not Reported	T	300		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Growth	LOEL	Not Reported	T	300		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc	Fathead Minnow	Fish	Fresh	Growth	MATC	Not Reported	T	125	NA	NR	ug/L	LAB	1985. Norberg, T.J., and D.I. Mount. A New Fathead Minnow (Pimephales promelas) Subchronic Toxicity Test. Environ. Toxicol. Chem.4(5): 711-718.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	186	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	187	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	405	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	412	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	183	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	MATC	Whole Organism	T	186	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	125		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	275	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	285	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	128	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	129	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	277	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	291	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	117	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	128	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	275	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NOEC	Whole Organism	T	275	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Growth	NOEL	Not Reported	T	300		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..
Zinc	Fathead Minnow	Fish	Fresh	Growth	NR		T	600	NA	NR	ug/L	LAB	1989. Hobson, J.F., and W.J. Birge. Acclimation-Induced Changes in Toxicity and Induction of Metallothionein-Like Proteins in the Fathead Minnow Following Sublethal Exposure to Zinc. Environ. Toxicol. Chem.8(2): 157-169.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Whole Organism	T	NR		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Whole Organism	T	NR		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Whole Organism	T	NR		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Growth	NR	Not Reported	T	295	NA	NR	ug/L	LAB	1978. Benoit, D.A., and G.W. Holcombe. Toxic Effects of Zinc on Fathead Minnows (Pimephales promelas) in Soft Water. J. Fish Biol.13(6): 701-708.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	10.4		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	12.8		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	13		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	14.2		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	16.6		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	17.1		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	18		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	19.3		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	19.5		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	6.9		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11.4		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13.4		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	14.6		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15.1		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	17		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	17.4		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	19.1		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	20.4		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	20.5		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7.4		NC	uM	LAB	2006. Bringolf, R.B., B.A. Morris, C.J. Boese, R.C. Santore, H.E. Allen, and J.S. Meyer. Influence of Dissolved Organic Matter on Acute Toxicity of Zinc to Larval Fathead Minnows (Pimephales promelas). Arch. Environ. Contam. Toxicol.51(3): 438-444.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2540	NA	NR	ug/L	LAB	1989. Hobson, J.F., and W.J. Birge. Acclimation-Induced Changes in Toxicity and Induction of Metallothionein-Like Proteins in the Fathead Minnow Following Sublethal Exposure to Zinc. Environ. Toxicol. Chem.8(2): 157-169.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2159	D	1857	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	238	NA	NR	ug/L	LAB	1985. Norberg, T.J., and D.I. Mount. A New Fathead Minnow (Pimephales promelas) Subchronic Toxicity Test. Environ. Toxicol. Chem.4(5): 711-718.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	238	NA	NR	ug/L	LAB	1985. Norberg, T.J., and D.I. Mount. A New Fathead Minnow (Pimephales promelas) Subchronic Toxicity Test. Environ. Toxicol. Chem.4(5): 711-718.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	2580		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	47700		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6880	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7620	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6888	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6900	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7450	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7620	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	2580	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	50200	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	38100	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	47700	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	393	D	387	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Evaluation of Site-Specific Criteria for Copper and Zinc: An Integration of Metal Addition Toxicity, Effluent and Receiving Water Toxicity, and Ecological Survey Data. EPA-600/3-86-026, U.S.EPA, Duluth, MN: 68 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	551	D	550	ug/L	LAB	1986. Carlson, A.R., H. Nelson, and D. Hammermeister. Evaluation of Site-Specific Criteria for Copper and Zinc: An Integration of Metal Addition Toxicity, Effluent and Receiving Water Toxicity, and Ecological Survey Data. EPA-600/3-86-026, U.S.EPA, Duluth, MN: 68 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6090	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7450	NA	NR	ug/L	LAB	1983. Benson, W.H., and W.J. Birge. Heavy Metal Tolerance and Metallothionein Induction in Fathead Minnows: Results From Field and Laboratory Investigations. Environ. Toxicol. Chem.4(2): 209-217.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	43700	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5960	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6090	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6140	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8490	NR	NR	ug/L	LAB	1983. Birge, W.J., W.H. Benson, and J.A. Black. The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish. Res.Rep.No.141, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 26 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NR	NR	ug/L	NR	1999. Gillespie, W.B.J., W.B. Hawkins, J.H.,Jr. Rodgers, M.L. Cano, and P.B. Dorn. Transfers and Transformations of Zinc in Flow-Through Wetland Microcosms. Ecotoxicol. Environ. Saf.43(2): 126-132.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2270		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2320		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2650		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2800		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2980		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3500		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4230		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4280		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5270		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6580		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7880		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4180		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4200		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	4260		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6010		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	6400		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	60		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1270		NC	ug/L	LAB	1998. Erten-Unal, M., B.G. Wixson, N. Gale, and J.L. Pitt. Evaluation of Toxicity, Bioavailability and Speciation of Lead, Zinc and Cadmium in Mine/Mill Wastewaters. Chem. Spec. Bioavail.10(2): 37-46.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	311.9		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	950	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1570	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1690	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2470	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2630	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	950	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	284.4	NA	NR	ug/L	LAB	1997. Diamond, J.M., D.E. Koplish, J. McMahon III, and R. Rost. Evaluation of the Water-Effect Ratio Procedure for Metals in a Riverine System. Environ. Toxicol. Chem.16(3): 509-520.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	303	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	313	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	322	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1969. Brungs, W.A.. Chronic Toxicity of Zinc to the Fathead Minnow, Pimephales promelas Rafinesque. Trans. Am. Fish. Soc.98(2): 272-279.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1820	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1850	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	20960	NA	NR	ug/L	LAB	1986. Hall, W.S., K.L. Dickson, F.Y. Saleh, J.H.,Jr. Rodgers, D. Wilcox, and A. Entazami. Effects of Suspended Solids on the Acute Toxicity of Zinc to Daphnia magna and Pimephales promelas. Water Resour. Bull.22(6): 913-920.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	2610	NA	NR	ug/L	LAB	1979. Broderius, S.J., and L.L.,Jr. Smith. Lethal and Sublethal Effects of Binary Mixtures of Cyanide and Hexavalent Chromium, Zinc, or Ammonia to the Fathead Minnow (Pimephales promelas) and Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.36(2): 164-172.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	660	NA	NR	ug/L	LAB	1978. Goettl, J.P.J., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-13, DNR, Boulder, CO: 46.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	NA	NR	ug/L	LAB	1969. Brungs, W.A.. Chronic Toxicity of Zinc to the Fathead Minnow, Pimephales promelas Rafinesque. Trans. Am. Fish. Soc.98(2): 272-279.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	870	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1978. Benoit, D.A., and G.W. Holcombe. Toxic Effects of Zinc on Fathead Minnows (Pimephales promelas) in Soft Water. J. Fish Biol.13(6): 701-708.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	330	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	780	NA	NR	ug/L	LAB	1993. Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environ. Toxicol. Chem.12: 1261-1266.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	204	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	247	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	282	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	289	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	2980	NA	NR	ug/L	LAB	1990. Bowen, G.M.R.. Joint Action of Sublethal Copper and Zinc on Locomotory Behaviour of Fathead Minnows. M.S.Thesis, Univ.of Guelph, Canada: 100 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	15400	NA	NR	ug/L	LAB	1989. Korver, R.M., and J.B. Sprague. Zinc Avoidance by Fathead Minnows (Pimephales promelas): Computerized Tracking and Greater Ecological Relevance. Can. J. Fish. Aquat. Sci.46(2): 494-502.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	1370	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	D	60	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1270	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1830	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1380	NA	NR	ug/L	LAB	1992. Gale, N.L., B.G. Wixson, and M. Erten. An Evaluation of the Acute Toxicity of Lead, Zinc, and Cadmium in Missouri Ozark Groundwater. Proc. Univ. Mo. Annu. Conf. Trace Subst. Environ. Health25: 169-183.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	12000	NA	NR	ug/L	LAB	1969. Brungs, W.A.. Chronic Toxicity of Zinc to the Fathead Minnow, Pimephales promelas Rafinesque. Trans. Am. Fish. Soc.98(2): 272-279.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1969. Brungs, W.A.. Chronic Toxicity of Zinc to the Fathead Minnow, Pimephales promelas Rafinesque. Trans. Am. Fish. Soc.98(2): 272-279.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3100	NA	NR	ug/L	LAB	1979. Judy, R.D.J., and P.H. Davies. Effects of Calcium Addition as Ca(NO3)2 on Zinc Toxicity to Fathead Minnows, (Pimephales promelas). Bull. Environ. Contam. Toxicol.22(1-2): 88-94.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3400*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7000*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	7200*	NA	NR	ug/L	LAB	1986. Ewell, W.S., J.W. Gorsuch, R.O. Kringle, K.A. Robillard, and R.C. Spiegel. Simultaneous Evaluation of the Acute Effects of Chemicals on Seven Aquatic Species. Environ. Toxicol. Chem.5(9): 831-840.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	238	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	282	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	10550	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	11000	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3600	NA	NR	ug/L	LAB	1988. Dawson, D.A., E.F. Stebler, S.L. Burks, and J.A. Bantle. Evaluation of the Developmental Toxicity of Metal-Contaminated Sediments Using Short-Term Fathead Minnow and Frog Embryo-Larval Assays. Environ. Toxicol. Chem.7(1): 27-34.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	243	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.

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Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	298	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	313	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1630	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1760	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	870	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	203	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	289	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5140	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	5490	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1480	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1570	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1610	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1620	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1780	NA	NR	ug/L	LAB	1965. Pickering, Q.H., and W.N. Vigor. The Acute Toxicity of Zinc to Eggs and Fry of the Fathead Minnow. Prog. Fish-Cult.27(3): 153-157.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	3210	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	34500	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	880	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	8900	NA	NR	ug/L	LAB	1968. Rachlin, J.W., and A. Perlmutter. Response of an Inbred Strain of Platyfish and the Fathead Minnow to Zinc. Prog. Fish-Cult.30(4): 203-207.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	960	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	2550	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	2700	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	33400	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	780	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	7800	NA	NR	ug/L	LAB	1968. Rachlin, J.W., and A. Perlmutter. Response of an Inbred Strain of Platyfish and the Fathead Minnow to Zinc. Prog. Fish-Cult.30(4): 203-207.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	960	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	12500	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	12500	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	12500	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	13600	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	13700	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	13800	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	15500	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	18500	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	19000	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	25000	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	29000	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	35500	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	4700	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	5100	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	6200	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	8100	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	8200	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	9900	NA	NR	ug/L	LAB	1966. Mount, D.I.. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Int. J. Air Water Pollut.10: 49-56.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	2330	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	2550	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	33400	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	7630	NA	NR	ug/L	LAB	1968. Rachlin, J.W., and A. Perlmutter. Response of an Inbred Strain of Platyfish and the Fathead Minnow to Zinc. Prog. Fish-Cult.30(4): 203-207.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	780	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LC50*	Not Reported	T	960	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LETC	Not Reported	T	1965		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LETC	Not Reported	T	3865		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LETC	Not Reported	T	5270		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LETC	Not Reported	T	1330		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LETC	Not Reported	T	2600		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LETC	Not Reported	T	4230		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LETC	Not Reported	T	5020		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	500		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	271	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	275	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	271	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	285	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	270	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	565	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	615	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	LOEC	Not Reported	T	285	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	300		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	300		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	LOEL	Not Reported	T	300		NC	ug/L	LAB	2006. Diamond, J.M., S.J. Klaine, and J.B. Butcher. Implications of Pulsed Chemical Exposures for Aquatic Life Criteria and Wastewater Permit Limits. Environ. Sci. Technol.40(16): 5132-5138.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	5520		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	186	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	187	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	186	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	188	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	183	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	405	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	412	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	MATC	Not Reported	T	183	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	250		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	546	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	128	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	129	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	128	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	117	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	129	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	277	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	291	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NOEC	Not Reported	T	117	NR	NR	ug/L	LAB	1989. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. Environ. Toxicol. Chem.8(11): 1075-1089.
Zinc	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Carlson, A.R., and T.H. Roush. Site-Specific Water Quality Studies of the Straight River, Minnesota: Complex Effluent Toxicity, Zinc Toxicity, and Biological Survey Relationships. EPA/600/3-85/005, U.S.EPA, Duluth, MN: 60 p..
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Zinc chloride (ZnCl2)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	295	NA	NR	ug/L	LAB	1978. Benoit, D.A., and G.W. Holcombe. Toxic Effects of Zinc on Fathead Minnows (Pimephales promelas) in Soft Water. J. Fish Biol.13(6): 701-708.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	1300	NA	NR	ug/L	LAB	1969. Brungs, W.A.. Chronic Toxicity of Zinc to the Fathead Minnow, Pimephales promelas Rafinesque. Trans. Am. Fish. Soc.98(2): 272-279.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	760	NA	NR	ug/L	LAB	1979. Broderius, S.J., and L.L.,Jr. Smith. Lethal and Sublethal Effects of Binary Mixtures of Cyanide and Hexavalent Chromium, Zinc, or Ammonia to the Fathead Minnow (Pimephales promelas) and Rainbow Trout (Salmo gairdneri). J. Fish. Res. Board Can.36(2): 164-172.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	22800		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	23400		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5830		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5890		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	8500		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	11400		NC	ug/L	LAB	1981. Drendel, G.H.. The Toxicity of Zinc to the Fathead Minnow in Soft, Hard, and Very Hard Waters. M.S.Thesis, Colorado State Univ., Ft.Collins, CO: 85 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2800	NA	NR	ug/L	LAB	1969. Brungs, W.A.. Chronic Toxicity of Zinc to the Fathead Minnow, Pimephales promelas Rafinesque. Trans. Am. Fish. Soc.98(2): 272-279.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	546	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	605	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	535	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	550	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	565	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	615	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	535	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	605	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	59.6	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	29	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	59.6	NR	NR	ug/L	LAB	1987. Norberg-King, T.J.. An Evaluation of the Fathead Minnow Seven-Day Subchronic Test for Estimating Chronic Toxicity. M.S.Thesis, University of Wyoming, Laramie, WY: 80 p..
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1978. Benoit, D.A., and G.W. Holcombe. Toxic Effects of Zinc on Fathead Minnows (Pimephales promelas) in Soft Water. J. Fish Biol.13(6): 701-708.
Sulfuric acid, Zinc salt (1:1)	Fathead Minnow	Fish	Fresh	Reproduction	NR		T	180	NA	NR	ug/L	LAB	1969. Brungs, W.A.. Chronic Toxicity of Zinc to the Fathead Minnow, Pimephales promelas Rafinesque. Trans. Am. Fish. Soc.98(2): 272-279.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Growth	LOEC	Whole Organism	T	51	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Growth	MATC	Not Reported	T	NR	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Growth	MATC	Whole Organism	T	NR	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Growth	NOEC	Whole Organism	T	26	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Growth	NR	Whole Organism	T	139	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Growth	NR	Whole Organism	T	139	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	LOEC	Not Reported	T	0.034	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	LOEC	Not Reported	T	51	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	NOEC	Not Reported	T	0.017	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	NOEC	Not Reported	T	26	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	139	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	51	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	267	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	85	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	139	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	NR	Not Reported	T	575	NA	NR	ug/L	LAB	1981. Rahel, F.J.. Selection for Zinc Tolerance in Fish: Results From Laboratory and Wild Populations. Trans. Am. Fish. Soc.110: 19-28.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	13.9	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	139	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Reproduction	LOEC	Not Reported	T	51	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Reproduction	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Reproduction	NOEC	Not Reported	T	26	NR	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Jordanella floridae. EPA-600/3-76-096, U.S.EPA, Duluth, MN: 40 p..
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Reproduction	NR	Not Reported	T	139	NR	NR	ug/L	LAB	1978. Spehar, R.L., E.N. Leonard, and D.L. De Foe. Chronic Effects of Cadmium and Zinc Mixtures on Flagfish (Jordanella floridae). Trans. Am. Fish. Soc.107(2): 354-360.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Reproduction	NR	Not Reported	T	139	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Sulfuric acid, Zinc salt (1:1)	Flagfish	Fish	Fresh	Reproduction	NR	Not Reported	T	85	NA	NR	ug/L	LAB	1976. Spehar, R.L.. Cadmium and Zinc Toxicity to Flagfish, Jordanella floridae. J. Fish. Res. Board Can.33(9): 1939-1945.
Sulfuric acid, Zinc salt (1:1)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	8890	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Sulfuric acid, Zinc salt (1:1)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1480	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Sulfuric acid, Zinc salt (1:1)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1480	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.
Sulfuric acid, Zinc salt (1:1)	Flannelmouth Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	1480	NA	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Evaluation of Inorganics, Singly and in Mixtures, to Flannelmouth Sucker Catostomus latipinnis in the San Juan River, New Mexico. Ecotoxicol. Environ. Saf.38(3): 296-308.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Fly Specked Hardyhead	Fish	Fresh	Mortality	LC50	Not Reported	T	600	NA	NR	ug/L	LAB	1984. Baker, L., and D. Walden. Acute Toxicity of Copper and Zinc to Three Fish Species from the Alligator Rivers Region. Tech.Memorandum No.8, Supervising Scientist for the Alligator Rivers Region, Australian Gov.Publ.Serv., Canberra, Australia: 27 p..
Sulfuric acid, Zinc salt (1:1)	Giant Gourami	Fish	Fresh	Mortality	LC50	Not Reported	T	43400*	NA	NR	ug/L	LAB	1979. Mishra, S., and A.K. Srivastava. Hematology as Index of Sublethal Toxicity of Zinc in a Freshwater Teleost. Bull. Environ. Contam. Toxicol.22(4-5): 695-698.
Sulfuric acid, Zinc salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid, Zinc salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid, Zinc salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	11400	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	7760	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50	Not Reported	T	8330	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Golden Shiner	Fish	Fresh	Mortality	LC50*	Not Reported	T	6000	NA	NR	ug/L	LAB	1969. Cairns, J.,Jr., W.T. Waller, and J.C. Smrchek. Fish Bioassays Contrasting Constant and Fluctuating Input of Toxicants. Rev. Biol.7: 75-91.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	10720	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	7960	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	5420	NA	NR	ug/L	LAB	1990. Nor, Y.M.. Effects of Organic Ligands on Toxicity of Copper and Zinc to Carassius auratus. Chem. Spec. Bioavail.3(3): 111-115.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2540	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	103000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50	Not Reported	T	40000	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	9070	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	6440	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	6440	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	7500	NA	NR	ug/L	LAB	1969. Cairns, J.,Jr., W.T. Waller, and J.C. Smrchek. Fish Bioassays Contrasting Constant and Fluctuating Input of Toxicants. Rev. Biol.7: 75-91.
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR	Not Reported	T	1000000	NA	NR	ug/L	LAB	1937. Ellis, M.M.. Detection and Measurement of Stream Pollution. In: Bull.Bur.Fish.No.22, U.S.Dep.Commerce, Washington, DC: 365-437.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1996. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Goldfish (Carassius auratus gibelio Bloch) Breeding in Different Concentrations of Zinc. Pol. Arch. Hydrobiol.43(3): 365-371.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5000		NC	ug/L	LAB	2005. Zhang, Y.M., D.J. Huang, Y.Q. Wang, J.H. Liu, R.L. Yu, and J. Long. Heavy Metal Accumulation and Tissue Damage in Goldfish Carassius auratus. Bull. Environ. Contam. Toxicol.75(6): 1191-1199.
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5000		NC	ug/L	LAB	2005. Zhang, Y.M., D.J. Huang, Y.Q. Wang, J.H. Liu, R.L. Yu, and J. Long. Heavy Metal Accumulation and Tissue Damage in Goldfish Carassius auratus. Bull. Environ. Contam. Toxicol.75(6): 1191-1199.
Sulfuric acid, Zinc salt (1:1)	Goldfish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	5000		NC	ug/L	LAB	2005. Zhang, Y.M., D.J. Huang, Y.Q. Wang, J.H. Liu, R.L. Yu, and J. Long. Heavy Metal Accumulation and Tissue Damage in Goldfish Carassius auratus. Bull. Environ. Contam. Toxicol.75(6): 1191-1199.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Reproduction	LOEC	Not Reported	T	2500		NC	ug/L	LAB	1996. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Goldfish (Carassius auratus gibelio Bloch) Breeding in Different Concentrations of Zinc. Pol. Arch. Hydrobiol.43(3): 365-371.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Reproduction	LOEC	Not Reported	T	2500		NC	ug/L	LAB	1996. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Goldfish (Carassius auratus gibelio Bloch) Breeding in Different Concentrations of Zinc. Pol. Arch. Hydrobiol.43(3): 365-371.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Reproduction	NOEC	Not Reported	T	2500		NC	ug/L	LAB	1996. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Goldfish (Carassius auratus gibelio Bloch) Breeding in Different Concentrations of Zinc. Pol. Arch. Hydrobiol.43(3): 365-371.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Reproduction	NOEC	Not Reported	T	2500		NC	ug/L	LAB	1996. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Goldfish (Carassius auratus gibelio Bloch) Breeding in Different Concentrations of Zinc. Pol. Arch. Hydrobiol.43(3): 365-371.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Reproduction	NOEC	Not Reported	T	2500		NC	ug/L	LAB	1996. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Goldfish (Carassius auratus gibelio Bloch) Breeding in Different Concentrations of Zinc. Pol. Arch. Hydrobiol.43(3): 365-371.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Reproduction	NOEC	Not Reported	T	1000		NC	ug/L	LAB	1996. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Goldfish (Carassius auratus gibelio Bloch) Breeding in Different Concentrations of Zinc. Pol. Arch. Hydrobiol.43(3): 365-371.
Zinc chloride (ZnCl2)	Goldfish	Fish	Fresh	Reproduction	NOEC	Not Reported	T	1000		NC	ug/L	LAB	1996. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Goldfish (Carassius auratus gibelio Bloch) Breeding in Different Concentrations of Zinc. Pol. Arch. Hydrobiol.43(3): 365-371.
Sulfuric acid, Zinc salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Growth	LOEL	Whole Organism	D	1100		NC	ug/L	LAB	1974. Sabodash, V.M.. Survival Rate of Grass Carp Larvae After Exposure to Zinc Sulfate. Hydrobiol. J.10: 77-80.
Sulfuric acid, Zinc salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Growth	LOEL	Whole Organism	D	1100		NC	ug/L	LAB	1974. Sabodash, V.M.. Survival Rate of Grass Carp Larvae After Exposure to Zinc Sulfate. Hydrobiol. J.10: 77-80.
Sulfuric acid, Zinc salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Growth	LOEL	Whole Organism	D	1100		NC	ug/L	LAB	1974. Sabodash, V.M.. Survival Rate of Grass Carp Larvae After Exposure to Zinc Sulfate. Hydrobiol. J.10: 77-80.
Sulfuric acid, Zinc salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Growth	NOEL	Whole Organism	D	110		NC	ug/L	LAB	1974. Sabodash, V.M.. Survival Rate of Grass Carp Larvae After Exposure to Zinc Sulfate. Hydrobiol. J.10: 77-80.
Sulfuric acid, Zinc salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Growth	NOEL	Whole Organism	D	110		NC	ug/L	LAB	1974. Sabodash, V.M.. Survival Rate of Grass Carp Larvae After Exposure to Zinc Sulfate. Hydrobiol. J.10: 77-80.
Sulfuric acid, Zinc salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Growth	NOEL	Whole Organism	D	110		NC	ug/L	LAB	1974. Sabodash, V.M.. Survival Rate of Grass Carp Larvae After Exposure to Zinc Sulfate. Hydrobiol. J.10: 77-80.
Sulfuric acid, Zinc salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Growth	NR	Whole Organism	D	NR		NC	ug/L	LAB	1974. Sabodash, V.M.. Survival Rate of Grass Carp Larvae After Exposure to Zinc Sulfate. Hydrobiol. J.10: 77-80.
Sulfuric acid, Zinc salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	NOEL	Not Reported	D	1100		NC	ug/L	LAB	1974. Sabodash, V.M.. Survival Rate of Grass Carp Larvae After Exposure to Zinc Sulfate. Hydrobiol. J.10: 77-80.
Sulfuric acid, Zinc salt (1:1)	Grass Carp, White Amur	Fish	Fresh	Mortality	NOEL	Not Reported	D	1100		NC	ug/L	LAB	1974. Sabodash, V.M.. Survival Rate of Grass Carp Larvae After Exposure to Zinc Sulfate. Hydrobiol. J.10: 77-80.
Zinc chloride (ZnCl2)	Grass Carp, White Amur	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1977. Wong, M.H., K.C. Luk, and K.Y. Choi. The Effects of Zinc and Copper Salts on Cyprinus carpio and Ctenopharyngodon idellus. Acta Anat.99(4): 450-454.
Zinc nitrate	Grass Carp, White Amur	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.
Zinc nitrate	Grass Carp, White Amur	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.
Sulfuric acid, Zinc salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	32910		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.
Sulfuric acid, Zinc salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	33000		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.
Sulfuric acid, Zinc salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	44350		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	47860		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.
Sulfuric acid, Zinc salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	51930		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.
Sulfuric acid, Zinc salt (1:1)	Guaru	Fish	Fresh	Mortality	LC50	Not Reported	T	56790		NC	ug/L	LAB	1998. Da Silva Kraus, L.A., A.C.T. Bonecker, N. De Almeida, and A. Vital. Acute Toxicity of Potassium Dichromate, Sodium Dodecyl Sulfate, Copper and Zinc to Poecilia vivipara (Osteichthyes, Cyprinodontiformes). Fresenius Environ. Bull.7(11-12): 654-658.
Sulfuric acid, Zinc salt (1:1)	Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	8400	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Gudgeon	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	21700	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	32700	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	95000	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	20300	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	27300	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	70000	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	18800	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	25300	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	57000	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	15000	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	23300	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	48300	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of Hardness on the Toxicity of Zinc Sulfate to Fish Lepidocephalichthyes guntea. Environ. Ecol.4(1): 115-117.
Sulfuric acid, Zinc salt (1:1)	Guntea Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	4400*	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Influence of pH on the Toxicity and Accumulation of Zinc in the Freshwater Fish Lepidocephalichthyes guntea. C. A. Sel. -Environ. Pollut. 15:107-19100G (1987) / Pollut. Res.5(3-4): 147-151.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NOEC	Not Reported	T	605	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NOEC	Not Reported	T	605	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NOEC	Not Reported	T	605	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NOEC	Not Reported	T	605	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NOEC	Not Reported	T	609	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NOEC	Not Reported	T	609	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NOEC	Not Reported	T	609	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NOEC	Not Reported	T	609	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NR	Not Reported	T	2500	NA	NR	ug/L	LAB	1994. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Effect of Zinc on Guppy (Poecilia reticulata) Reproduction. Pol. Arch. Hydrobiol.41(4): 489-493.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NR	Whole Organism	T	1150	NR	NR	ug/L	LAB	1962. Crandall, C.A., and C.J. Goodnight. Effects of Sublethal Concentrations of Several Toxicants on Growth of the Common Guppy, Lebistes reticulatus. Limnol. Oceanogr.7(2): 233-239.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NR		T	0.36	NA	NR	ug/L	LAB	1979. Uviovo, E.J., and D.D. Beatty. Effects of Chronic Exposure to Zinc on Reproduction in the Guppy (Poecilia reticulata). Bull. Environ. Contam. Toxicol.23(4-5): 650-657.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Growth	NR		T	0.88	NA	NR	ug/L	LAB	1979. Uviovo, E.J., and D.D. Beatty. Effects of Chronic Exposure to Zinc on Reproduction in the Guppy (Poecilia reticulata). Bull. Environ. Contam. Toxicol.23(4-5): 650-657.
Zinc chloride (ZnCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	6400		NC	ug/L	LAB	2001. Widianarko, B., F.X.S. Kuntoro, C.A.M. Van Gestel, and N.M. Van Straalen. Toxicokinetics and Toxicity of Zinc Under Time-Varying Exposure in the Guppy (Poecilia reticulata). Environ. Toxicol. Chem.20(4): 763-768.
Zinc chloride (ZnCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	9100		NC	ug/L	LAB	2001. Widianarko, B., F.X.S. Kuntoro, C.A.M. Van Gestel, and N.M. Van Straalen. Toxicokinetics and Toxicity of Zinc Under Time-Varying Exposure in the Guppy (Poecilia reticulata). Environ. Toxicol. Chem.20(4): 763-768.
Zinc chloride (ZnCl2)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	3250*	NA	NR	ug/L	LAB	1975. Anderson, P.D., and L.J. Weber. Toxic Response as a Quantitative Function of Body Size. Toxicol. Appl. Pharmacol.33(3): 471-483.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	14520		NC	ug/L	LAB	2001. Khunyakari, R.P., V. Tare, and R.N. Sharma. Effects of Some Trace Heavy Metals on Poecilia reticulata (Peters).. J. Environ. Biol.22(2): 141-144.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	12650		NC	ug/L	LAB	2001. Khunyakari, R.P., V. Tare, and R.N. Sharma. Effects of Some Trace Heavy Metals on Poecilia reticulata (Peters).. J. Environ. Biol.22(2): 141-144.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	103900	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	88720	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	106500	NA	NR	ug/L	LAB	1990. Vykusova, B., and Z. Svobodova. Acute Toxicity of Standards to Fish (Akutni Toxicita Standardu pro Ryby). Bull. V. U. R. H. Vodnany26(3): 15-20.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	75000	NA	NR	ug/L	LAB	1981. Khangarot, B.S., V.S. Durve, and V.K. Rajbanshi. Toxicity of Interactions of Zinc-Nickel, Copper-Nickel and Zinc-Nickel-Copper to a Freshwater Teleost, Lebistes reticulatus (Peters). Acta Hydrochim. Hydrobiol.9(5): 495-503.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	71610	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	59530	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	54950	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1740	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	5050	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	6400	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	63200*	NA	NR	ug/L	LAB	1986. Sehgal, R., and A.B. Saxena. Toxicity of Zinc to a Viviparous Fish, Lebistes reticulatus (Peters). Bull. Environ. Contam. Toxicol.36(6): 888-894.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	70000*	NA	NR	ug/L	LAB	1986. Sehgal, R., and A.B. Saxena. Toxicity of Zinc to a Viviparous Fish, Lebistes reticulatus (Peters). Bull. Environ. Contam. Toxicol.36(6): 888-894.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50	Not Reported	T	1450	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	NR	Mortality	LC50	Not Reported	T	630	NA	NR	ug/L	LAB	1977. Brkovic-Popovic, I., and M. Popovic. Study of the Toxicity of Mercury, Copper, Zinc and Trinitroresorcinol on Lebistes reticulateus, Method of Survival (Ispitivanje Toksicnosti Zive, Bakra, Cinka i Trinitrorezorcina na Lebistes reticulatus. Bioogled Kratko. Arh. Hig. Rada Toksikol.28(1): 3-16.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	2900	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	1960	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	80210*	NA	NR	ug/L	LAB	1979. Furmanska, M.. Studies of the Effect of Copper, Zinc, and Iron on the Biotic Components of Aquatic Ecosystems. Pol. Arch. Hydrobiol.26(1-2): 213-220.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	1270	NA	NR	ug/L	LAB	1966. Pickering, Q.H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. In: Proc. 19th Ind. Waste Conf. , Purdue University, West Lafayette, IN:578-591(1964) / Int. J. Air Water Pollut.10: 453-463.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LC50*	Not Reported	T	30000	NA	NR	ug/L	LAB	1969. Cairns, J.,Jr., W.T. Waller, and J.C. Smrchek. Fish Bioassays Contrasting Constant and Fluctuating Input of Toxicants. Rev. Biol.7: 75-91.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LETC	Not Reported	T	1350	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LETC	Not Reported	T	4400	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LETC	Not Reported	T	4500	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LETC	Not Reported	T	5200	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LETC	Not Reported	T	6300	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	LETC	Not Reported	T	1500	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NOEC	Not Reported	T	609	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NOEC	Not Reported	T	609	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Zinc	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	16500	NA	NR	ug/L	LAB	1993. Sharma, A., and M.S. Sharma. Vertebral Defects in Lebistes reticulatus (Peters) and Cyprinus carpio (Linnaeus) Exposed to Heavy Metals. Pollut. Res.12(3): 139-143.
Zinc	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1975. Jones, W.E.. Detection of Pollutants by Fish Tests. Water Treat. Exam.24: 132-139.
Zinc chloride (ZnCl2)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	2006. Gheorgiu, C., D.J. Marcogliese, and M. Scott. Concentration-Dependent Effects of Waterborne Zinc on Population Dynamics of Gyrodactylus turnbulli (Monogenea) on Isolated Guppies (Poecilia reticulata). Parasitology132(2): 225-232.
Zinc chloride (ZnCl2)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1969. Chen, C.W., and R.E. Selleck. A Kinetic Model of Fish Toxicity Threshold. J. Water Pollut. Control Fed.41(7): R294 - R308.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	2500	NA	NR	ug/L	LAB	1994. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Effect of Zinc on Guppy (Poecilia reticulata) Reproduction. Pol. Arch. Hydrobiol.41(4): 489-493.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Effect of Zinc on Guppy (Poecilia reticulata) Reproduction. Pol. Arch. Hydrobiol.41(4): 489-493.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1962. Crandall, C.A., and C.J. Goodnight. Effects of Sublethal Concentrations of Several Toxicants on Growth of the Common Guppy, Lebistes reticulatus. Limnol. Oceanogr.7(2): 233-239.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	0.36	NA	NR	ug/L	LAB	1979. Uviovo, E.J., and D.D. Beatty. Effects of Chronic Exposure to Zinc on Reproduction in the Guppy (Poecilia reticulata). Bull. Environ. Contam. Toxicol.23(4-5): 650-657.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	0.36	NA	NR	ug/L	LAB	1979. Uviovo, E.J., and D.D. Beatty. Effects of Chronic Exposure to Zinc on Reproduction in the Guppy (Poecilia reticulata). Bull. Environ. Contam. Toxicol.23(4-5): 650-657.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	0.88	NA	NR	ug/L	LAB	1979. Uviovo, E.J., and D.D. Beatty. Effects of Chronic Exposure to Zinc on Reproduction in the Guppy (Poecilia reticulata). Bull. Environ. Contam. Toxicol.23(4-5): 650-657.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	0.88	NA	NR	ug/L	LAB	1979. Uviovo, E.J., and D.D. Beatty. Effects of Chronic Exposure to Zinc on Reproduction in the Guppy (Poecilia reticulata). Bull. Environ. Contam. Toxicol.23(4-5): 650-657.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	1.7	NA	NR	ug/L	LAB	1979. Uviovo, E.J., and D.D. Beatty. Effects of Chronic Exposure to Zinc on Reproduction in the Guppy (Poecilia reticulata). Bull. Environ. Contam. Toxicol.23(4-5): 650-657.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	1.7	NA	NR	ug/L	LAB	1979. Uviovo, E.J., and D.D. Beatty. Effects of Chronic Exposure to Zinc on Reproduction in the Guppy (Poecilia reticulata). Bull. Environ. Contam. Toxicol.23(4-5): 650-657.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR	Not Reported	T	200000	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. The Effects of Time Intervals Before Feeding Since the Tolerance of Common Guppy (Lebistes reticulatus Peters) to Zinc. Acta Hydrochim. Hydrobiol.10(4): 405-408.
Zinc chloride (ZnCl2)	Guppy	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	260.3		NC	ug/L	LAB	2006. Gheorgiu, C., D.J. Marcogliese, and M. Scott. Concentration-Dependent Effects of Waterborne Zinc on Population Dynamics of Gyrodactylus turnbulli (Monogenea) on Isolated Guppies (Poecilia reticulata). Parasitology132(2): 225-232.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Effect of Zinc on Guppy (Poecilia reticulata) Reproduction. Pol. Arch. Hydrobiol.41(4): 489-493.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2500	NA	NR	ug/L	LAB	1994. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Effect of Zinc on Guppy (Poecilia reticulata) Reproduction. Pol. Arch. Hydrobiol.41(4): 489-493.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Reproduction	NOEC	Not Reported	T	605	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Reproduction	NOEC	Not Reported	T	609	NR	NR	ug/L	LAB	1981. Pierson, K.B.. Effects of Chronic Zinc Exposure on the Growth, Sexual Maturity, Reproduction, and Bioaccumulation of the Guppy, Poecilia reticulata. Can. J. Fish. Aquat. Sci.38(1): 23-31.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Reproduction	NR	Not Reported	T	2500	NA	NR	ug/L	LAB	1994. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Effect of Zinc on Guppy (Poecilia reticulata) Reproduction. Pol. Arch. Hydrobiol.41(4): 489-493.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Reproduction	NR	Not Reported	T	1210	NA	NR	ug/L	LAB	1994. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Effect of Zinc on Guppy (Poecilia reticulata) Reproduction. Pol. Arch. Hydrobiol.41(4): 489-493.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Reproduction	NR	Not Reported	T	2590	NA	NR	ug/L	LAB	1994. Bieniarz, K., P. Epler, and M. Sokolowska-Mikolajczyk. Effect of Zinc on Guppy (Poecilia reticulata) Reproduction. Pol. Arch. Hydrobiol.41(4): 489-493.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Reproduction	NR		T	0.36	NA	NR	ug/L	LAB	1979. Uviovo, E.J., and D.D. Beatty. Effects of Chronic Exposure to Zinc on Reproduction in the Guppy (Poecilia reticulata). Bull. Environ. Contam. Toxicol.23(4-5): 650-657.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Reproduction	NR		T	0.88	NA	NR	ug/L	LAB	1979. Uviovo, E.J., and D.D. Beatty. Effects of Chronic Exposure to Zinc on Reproduction in the Guppy (Poecilia reticulata). Bull. Environ. Contam. Toxicol.23(4-5): 650-657.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Reproduction	NR		T	63200*	NA	NR	ug/L	LAB	1986. Sehgal, R., and A.B. Saxena. Toxicity of Zinc to a Viviparous Fish, Lebistes reticulatus (Peters). Bull. Environ. Contam. Toxicol.36(6): 888-894.
Sulfuric acid, Zinc salt (1:1)	Guppy	Fish	Fresh	Reproduction	NR		T	70000*	NA	NR	ug/L	LAB	1986. Sehgal, R., and A.B. Saxena. Toxicity of Zinc to a Viviparous Fish, Lebistes reticulatus (Peters). Bull. Environ. Contam. Toxicol.36(6): 888-894.
Sulfuric acid, Zinc salt (1:1)	Harlequinfish, Red Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	110800	NA	NR	ug/L	LAB	1990. Vykusova, B., and Z. Svobodova. Acute Toxicity of Standards to Fish (Akutni Toxicita Standardu pro Ryby). Bull. V. U. R. H. Vodnany26(3): 15-20.
Sulfuric acid, Zinc salt (1:1)	Harlequinfish, Red Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	161000	NA	NR	ug/L	LAB	1988. Svobodova, Z., and B. Vykusova. Comparing the Sensitivity of Rainbow Trout and Rasbora heteromorpha to Various Toxic Substances (Porovnani Citlivosti Pstruha Duhoveho a Razbory Klinoskvrnne k Ruznym Cizorodym Latkam). Bull. V. U. R. H. Vodnany24(2): 14-19.
Zinc chloride (ZnCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	75000		NC	ug/L	LAB	1997. Hemalatha, S., and T.K. Banerjee. Histopathological Analysis of Sublethal Toxicity of Zinc Chloride to the Respiratory Organs of the Airbreathing Catfish Heteropneustes Fossilis (Bloch). Biol. Res.30(1): 11-21.
Zinc chloride (ZnCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	270000	NA	NR	ug/L	LAB	1998. Banerjee, V.. Influence of Zinc and Mercury on Blood Parameters of the Fish Heteropneustes fossilis. Environ. Ecol.16(1): 79-84.
Zinc chloride (ZnCl2)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	75000	NA	NR	ug/L	LAB	1993. Hemalatha, S., and T.K. Banerjee. Acute Toxicity of the Heavy Metal-Zinc (a Trace Element) on the Mucous Cells of the Air Sac (a Modified Gill Structure) of the Air-Breathing Catfish. J. Freshw. Biol.5(3): 233-240.
Sulfuric acid, Zinc salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	237500		NC	ug/L	LAB	1994. Agrawal, U.. Effect of Sublethal Concentration of Zinc on Some Hematological Parameters of Freshwater Indian Catfish, Heteropneustes fossilis. J. Adv. Zool.15(2): 86-89.
Sulfuric acid, Zinc salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	123000	NA	NR	ug/L	LAB	1993. Saxena, K.K., A.K. Dubey, and R.R.S. Chauhan. Experimental Studies on Toxicity of Zinc and Cadmium to Heteropneustes fossilis (Bl.). J. Freshw. Biol.5(4): 343-346.
Sulfuric acid, Zinc salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	99100	NA	NR	ug/L	LAB	1993. Saxena, K.K., A.K. Dubey, and R.R.S. Chauhan. Experimental Studies on Toxicity of Zinc and Cadmium to Heteropneustes fossilis (Bl.). J. Freshw. Biol.5(4): 343-346.
Sulfuric acid, Zinc salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	79400	NA	NR	ug/L	LAB	1993. Saxena, K.K., A.K. Dubey, and R.R.S. Chauhan. Experimental Studies on Toxicity of Zinc and Cadmium to Heteropneustes fossilis (Bl.). J. Freshw. Biol.5(4): 343-346.
Sulfuric acid, Zinc salt (1:1)	Indian Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	60300	NA	NR	ug/L	LAB	1993. Saxena, K.K., A.K. Dubey, and R.R.S. Chauhan. Experimental Studies on Toxicity of Zinc and Cadmium to Heteropneustes fossilis (Bl.). J. Freshw. Biol.5(4): 343-346.
Sulfuric acid, Zinc salt (1:1)	Indian Freshwater Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	8.109	NA	NR	ug/L	LAB	1989. Gaikwad, S.A.. Effects of Mixture and Three Individual Heavy Metals on Susceptibility of Three Fresh Water Fishes. Pollut. Res.8(1): 33-35.
Zinc	Jaguar Guapote, Managua Cichli	Fish	Fresh	Mortality	LC50	Not Reported	T	165000	NA	NR	ug/L	LAB	1992. Zang, W., X. Xu, X. Dai, and Z. Zhu. Acute Toxicity and Accumulation of Zn2+ on Young Freshwater Grouper (Cichlasoma managuense) and Bullfrog (Rana catesbeiana) Tadpole. Freshwater Fish. (Danshui Yuye)6: 12-14.
Zinc	Jaguar Guapote, Managua Cichli	Fish	Fresh	Mortality	LC50	Not Reported	T	150000	NA	NR	ug/L	LAB	1992. Zang, W., X. Xu, X. Dai, and Z. Zhu. Acute Toxicity and Accumulation of Zn2+ on Young Freshwater Grouper (Cichlasoma managuense) and Bullfrog (Rana catesbeiana) Tadpole. Freshwater Fish. (Danshui Yuye)6: 12-14.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Jaguar Guapote, Managua Cichli	Fish	Fresh	Mortality	LC50	Not Reported	T	77980	NA	NR	ug/L	LAB	1992. Zang, W., X. Xu, X. Dai, and Z. Zhu. Acute Toxicity and Accumulation of Zn2+ on Young Freshwater Grouper (Cichlasoma managuense) and Bullfrog (Rana catesbeiana) Tadpole. Freshwater Fish. (Danshui Yuye)6: 12-14.
Sulfuric acid, Zinc salt (1:1)	Japanese Eel	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.
Sulfuric acid, Zinc salt (1:1)	Japanese Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.
Sulfuric acid, Zinc salt (1:1)	Japanese Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	6380	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.
Sulfuric acid, Zinc salt (1:1)	Japanese Eel	Fish	Fresh	Mortality	LC50	Not Reported	T	8110	NA	NR	ug/L	LAB	1996. Yang, H.N., and H.C. Chen. The Influence of Temperature on the Acute Toxicity and Sublethal Effects of Copper, Cadmium and Zinc to Japanese Eel, Anguilla japonica. Acta Zool. Taiwanica7(1): 29-38.
Sulfuric acid, Zinc salt (1:1)	Japanese Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	29000	NA	NR	ug/L	LAB	1985. Cruz, E.R., and K. Muroga. Studies on the Tolerance of Japanese Eel (Anguilla japonica) to Zinc Sulfate. Fish Pathol.20(4): 459-461.
Sulfuric acid, Zinc salt (1:1)	Japanese Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	14000	NA	NR	ug/L	LAB	1985. Cruz, E.R., and K. Muroga. Studies on the Tolerance of Japanese Eel (Anguilla japonica) to Zinc Sulfate. Fish Pathol.20(4): 459-461.
Sulfuric acid, Zinc salt (1:1)	Japanese Eel	Fish	Fresh	Mortality	LC50*	Not Reported	T	11000	NA	NR	ug/L	LAB	1985. Cruz, E.R., and K. Muroga. Studies on the Tolerance of Japanese Eel (Anguilla japonica) to Zinc Sulfate. Fish Pathol.20(4): 459-461.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	4600	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	5800	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	6000	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	6000	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	6400	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	6800	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	7500	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	7600	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	7800	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	8000	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	8000	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	8000	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	8200	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	EC50	Not Reported	T	8200	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	10200	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	10800	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	11700	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	13700	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	14100	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	15100	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	16900	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	7100	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	7700	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	8600	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	9000	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	9000	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	9100	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc	Killifish	Fish	Fresh	Mortality	LC50	Not Reported	T	9800	NR	NR	ug/L	LAB	1999. Shedd, T.R., M.W. Widder, M.W. Toussaint, M.C. Sunkel, and E. Hull. Evaluation of the Annual Killifish Nothobranchius guentheri as a Tool for Rapid Acute Toxicity Screening. Environ. Toxicol. Chem.18(10): 2258-2261.
Zinc chloride (ZnCl2)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	5160	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Zinc chloride (ZnCl2)	Largemouth Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	5180	NA	NR	ug/L	LAB	1980. Black, J.A., and W.J. Birge. An Avoidance Response Bioassay for Aquatic Pollutants. Res.Report No.123, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 34-180490.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	3500	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	540*	NA	NR	ug/L	LAB	1987. Joshi, S.N., and P. Chamoli. Toxicity of Zinc Sulfate to the Hill Stream Fish Noemacheilus montanus. Aquat. Sci. Fish. Abstr.17(8, Pt. 1): 11826-1Q17.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	340*	NA	NR	ug/L	LAB	1987. Joshi, S.N., and P. Chamoli. Toxicity of Zinc Sulfate to the Hill Stream Fish Noemacheilus montanus. Aquat. Sci. Fish. Abstr.17(8, Pt. 1): 11826-1Q17.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	750	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	220*	NA	NR	ug/L	LAB	1987. Joshi, S.N., and P. Chamoli. Toxicity of Zinc Sulfate to the Hill Stream Fish Noemacheilus montanus. Aquat. Sci. Fish. Abstr.17(8, Pt. 1): 11826-1Q17.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	140*	NA	NR	ug/L	LAB	1987. Joshi, S.N., and P. Chamoli. Toxicity of Zinc Sulfate to the Hill Stream Fish Noemacheilus montanus. Aquat. Sci. Fish. Abstr.17(8, Pt. 1): 11826-1Q17.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	NR	Not Reported	T	3000	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid, Zinc salt (1:1)	Loach	Fish	Fresh	Mortality	NR	Not Reported	T	1500	NA	NR	ug/L	LAB	1990. Joshi, S.N., and V.P. Semwal. Toxicity of Zinc Sulphate and Copper Sulphate to a Hill-Stream Cobitid Fish Noemacheilus rupicola. Indian J. Ecol.17(2): 148-150.
Sulfuric acid, Zinc salt (1:1)	Longfin Dace	Fish	Fresh	Mortality	LC50	Not Reported	T	790	NA	NR	ug/L	LAB	1978. Lewis, M.. Acute Toxicity of Copper, Zinc, and Manganese in Single and Mixed Salt Solutions to Juvenile Longfin Dace, Agosia chrysogaster. J. Fish Biol.13(6): 695-700.
Zinc chloride (ZnCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Zinc chloride (ZnCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	35000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Zinc chloride (ZnCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	40000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Zinc chloride (ZnCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Zinc chloride (ZnCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	LC50	Not Reported	T	20000	NA	NR	ug/L	LAB	1986. Tsuji, S., Y. Tonogai, Y. Ito, and S. Kanoh. The Influence of Rearing Temperatures on the Toxicity of Various Environmental Pollutants for Killifish (Oryzias latipes). J. Hyg. Chem. (Eisei Kagaku)32(1): 46-53.
Zinc chloride (ZnCl2)	Medaka, High-Eyes	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Hiraoka, Y., S. Ishizawa, T. Kamada, and H. Okuda. Acute Toxicity of 14 Different Kinds of Metals Affecting Medaka Fry. Hiroshima J. Med. Sci.34(3): 327-330.
Sulfuric acid, Zinc salt (1:1)	Milkfish, Salmon-Herring	Fish	Fresh	Mortality	LC50	Not Reported	T	15000	NR	NR	ug/L	LAB	1993. Dinesan, K.C., and K.C. George. Histopathological Studies on Zinc Toxicity in Milkfish Chanos chanos Forsskal. In: Mariculture Research Under the Postgraduate Programme in Mariculture, Part 3, Special Publication 54, Central Marine Fisheries Research Institute, Ernakulam, India: 25-27.
Sulfuric acid, Zinc salt (1:1)	Minnow	Fish	Fresh	Growth	NR	Multiple Tissue/Orga	T	2100	NA	NR	nmol/L	LAB	1992. Glynn, A.W., C. Haux, and C. Hogstrand. Chronic Toxicity and Metabolism of Cd and Zn in Juvenile Minnows (Phoxinus phoxinus) Exposed to a Cd and Zn Mixture. Can. J. Aquat. Sci.49(10): 2070-2079.
Zinc nitrate	Minnow	Fish	Fresh	Growth	NR		T	130	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Growth	NR		T	130	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Growth	NR		T	200	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Growth	NR		T	50	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Sulfuric acid, Zinc salt (1:1)	Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1422.9	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Sulfuric acid, Zinc salt (1:1)	Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	1066.4	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Sulfuric acid, Zinc salt (1:1)	Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	813.3	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Sulfuric acid, Zinc salt (1:1)	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	N	LAB	1927. Carpenter, K.E.. The Lethal Action of Soluble Metallic Salts on Fishes. Br. J. Exp. Biol.4: 378-391.
Sulfuric acid, Zinc salt (1:1)	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	2100	NA	NR	nmol/L	LAB	1992. Glynn, A.W., C. Haux, and C. Hogstrand. Chronic Toxicity and Metabolism of Cd and Zn in Juvenile Minnows (Phoxinus phoxinus) Exposed to a Cd and Zn Mixture. Can. J. Aquat. Sci.49(10): 2070-2079.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	900	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Vertebral Damage to Minnows Phoxinus phoxinus Exposed to Zinc. Oikos25(2): 134-139.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	60	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	2400	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Vertebral Damage to Minnows Phoxinus phoxinus Exposed to Zinc. Oikos25(2): 134-139.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	130	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	130	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	130	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	50	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	130	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Vertebral Damage to Minnows Phoxinus phoxinus Exposed to Zinc. Oikos25(2): 134-139.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Vertebral Damage to Minnows Phoxinus phoxinus Exposed to Zinc. Oikos25(2): 134-139.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Vertebral Damage to Minnows Phoxinus phoxinus Exposed to Zinc. Oikos25(2): 134-139.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	80	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	130	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	200	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR	Not Reported	T	300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Effect of Zinc on Growth of the Minnow Phoxinus phoxinus. Oikos25(1): 370-373.
Sulfuric acid, Zinc salt (1:1)	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	2000	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	21500	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	6800	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	6800	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3700	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	4300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. Vertebral Damage to Minnows Phoxinus phoxinus Exposed to Zinc. Oikos25(2): 134-139.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	3700	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	780	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1300	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Zinc nitrate	Minnow	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	330	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Sulfuric acid, Zinc salt (1:1)	Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	250	NR	NR	ug/L	LAB	1994. Chen, H.C., and Y.K. Yuan. Acute Toxicity of Copper, Cadmium and Zinc to Freshwater Fish Acrosscheilus paradoxus. Acta Zool. Taiwanica5(2): 45-60.
Sulfuric acid, Zinc salt (1:1)	Minnow	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1700	NR	NR	ug/L	LAB	1999. Sanchez-Galan, S., A.R. Linde, and E. Garcia-Vazquez. Brown Trout and European Minnow as Target Species for Genotoxicity Tests: Differential Sensitivity to Heavy Metals. Ecotoxicol. Environ. Saf.43(3): 301-304.
Zinc nitrate	Minnow	Fish	Fresh	Reproduction	NR		T	130	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Zinc nitrate	Minnow	Fish	Fresh	Reproduction	NR		T	50	NA	NR	ug/L	LAB	1974. Bengtsson, B.E.. The Effects of Zinc on the Mortality and Reproduction of the Minnow, Phoxinus phoxinus L. Arch. Environ. Contam. Toxicol.2(4): 342-355.
Zinc	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	100000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Zinc	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	115000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Zinc	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	120000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Zinc	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	140000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Zinc	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	140000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Zinc	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	150000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Zinc	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	50000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Zinc	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	80000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Zinc	Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	90000	NR	NR	ug/L	LAB	1997. Kallanagoudar, Y.P., and H.S. Patil. Influence of Water Hardness on Copper, Zinc and Nickel Toxicity to Gambusia affinis (B&G). J. Environ. Biol.18(4): 409-413.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	EC50	Not Reported	T	272		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	EC50	Not Reported	T	75		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	LOEC	Not Reported	T	150		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	MATC	Not Reported	T	75		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Zinc	Mottled Sculpin	Fish	Fresh	Growth	NOEC	Not Reported	D	379		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Zinc	Mottled Sculpin	Fish	Fresh	Growth	NOEC	Not Reported	D	379		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	NOEC	Not Reported	T	37		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	NOEL	Not Reported	T	320		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	NOEL	Not Reported	T	37		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	NR	Whole Organism	D	NR		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	NR	Whole Organism	D	NR		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	NR	Whole Organism	D	NR		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Growth	NR	Whole Organism	D	NR		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	266		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	266		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	266		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	439		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	302		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	283		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	278		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	279		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	273		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	33		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	38		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	233		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	32		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	231		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	75		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	32		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	156		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	107		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	107		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	230		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	261		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	T	431		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	92		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	94		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	57		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	62		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	45		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	48		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	41		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	42		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	38		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LC50	Not Reported	D	38		NC	ug/L	LAB	2002. Woodling, J., S. Brinkman, and S. Albeke. Acute and Chronic Toxicity of Zinc to the Mottled Sculpin Cottus bairdi. Environ. Toxicol. Chem.21(9): 1922-1926.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	LOEC	Not Reported	D	379		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LOEC	Not Reported	T	320		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	LOEC	Not Reported	T	150		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	MATC	Not Reported	D	255		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	MATC	Not Reported	T	219		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	MATC	Not Reported	T	75		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	NOEC	Not Reported	D	172		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NOEC	Not Reported	T	150		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NOEC	Not Reported	T	37		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	778		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	290		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	320		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	640		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Zinc	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	50		NC	ug/L	LAB	2005. Brinkman, S., and J. Woodling. Zinc Toxicity to the Mottled Sculpin (Cottus bairdi) in High-Hardness Water. Environ. Toxicol. Chem.24(6): 1515-1517.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	150		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	290		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	290		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	37		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mottled Sculpin	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	73		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	IC20	Not Reported	D	422	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	LOEC	Not Reported	D	744	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	MATC	Not Reported	D	532	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	NOEC	Not Reported	D	380	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Growth	NOEC	Whole Organism	D	422	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LC50	Not Reported	D	471	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LOEC	Not Reported	D	1507	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LOEC	Not Reported	D	422	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	LOEC	Not Reported	D	744	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	MATC	Not Reported	D	1059	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	MATC	Not Reported	D	296	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	MATC	Not Reported	D	532	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NOEC	Not Reported	D	744	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NOEC	Not Reported	D	208	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NOEC	Not Reported	D	380	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	821	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	1507	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Mountain Whitefish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	208	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Zinc	Mozambique Tilapia	Fish	Fresh	Growth	LOEL	Not Reported	T	13638		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Growth	LOEL	Not Reported	T	17048		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc chloride (ZnCl2)	Mozambique Tilapia	Fish	Fresh	Growth	LOEL	Fin	T	5000		NC	ug/L	LAB	2005. Verma, Y.. Retardation of Fin Regeneration in Freshwater Fish Oreochromis mossambicus by Zinc. Acta Hydrochim. Hydrobiol.32(6): 429-433.
Zinc chloride (ZnCl2)	Mozambique Tilapia	Fish	Fresh	Growth	LOEL	Fin	T	10000		NC	ug/L	LAB	2005. Verma, Y.. Retardation of Fin Regeneration in Freshwater Fish Oreochromis mossambicus by Zinc. Acta Hydrochim. Hydrobiol.32(6): 429-433.
Zinc chloride (ZnCl2)	Mozambique Tilapia	Fish	Fresh	Growth	LOEL	Fin	T	10000		NC	ug/L	LAB	2005. Verma, Y.. Retardation of Fin Regeneration in Freshwater Fish Oreochromis mossambicus by Zinc. Acta Hydrochim. Hydrobiol.32(6): 429-433.
Zinc chloride (ZnCl2)	Mozambique Tilapia	Fish	Fresh	Growth	LOEL	Fin	T	5000		NC	ug/L	LAB	2005. Verma, Y.. Retardation of Fin Regeneration in Freshwater Fish Oreochromis mossambicus by Zinc. Acta Hydrochim. Hydrobiol.32(6): 429-433.
Zinc	Mozambique Tilapia	Fish	Fresh	Growth	NOEL	Not Reported	T	56825		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Growth	NOEL	Not Reported	T	11365		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Growth	NOEL	Not Reported	T	13638		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Growth	NOEL	Whole Organism	T	68190		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc chloride (ZnCl2)	Mozambique Tilapia	Fish	Fresh	Growth	NOEL	Fin	T	5000		NC	ug/L	LAB	2005. Verma, Y.. Retardation of Fin Regeneration in Freshwater Fish Oreochromis mossambicus by Zinc. Acta Hydrochim. Hydrobiol.32(6): 429-433.
Zinc chloride (ZnCl2)	Mozambique Tilapia	Fish	Fresh	Growth	NOEL	Fin	T	5000		NC	ug/L	LAB	2005. Verma, Y.. Retardation of Fin Regeneration in Freshwater Fish Oreochromis mossambicus by Zinc. Acta Hydrochim. Hydrobiol.32(6): 429-433.
Zinc	Mozambique Tilapia	Fish	Fresh	Growth	NR	Not Reported	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Growth	NR	Not Reported	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Growth	NR	Not Reported	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Growth	NR	Whole Organism	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	%	LAB	1995. Sheela, M., G. Mallika, and S. Muniandy. Impact of Zinc on the Energetics of Feeding and Biochemical Status of Tissues in the Fish Oreochromis mossambicus. Environ. Ecol.13(2): 418-422.
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC16	Not Reported	T	1520		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Zinc	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	24300		NC	ug/L	LAB	1998. Lam, K.L., P.W. Ko, J.K.Y. Wong, and K.M. Chan. Metal Toxicity and Metallothionein Gene Expression Studies in Common Carp and Tilapia. Mar. Environ. Res.46(1-5): 563-566.
Zinc	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	16500		NC	ug/L	LAB	1998. Lam, K.L., P.W. Ko, J.K.Y. Wong, and K.M. Chan. Metal Toxicity and Metallothionein Gene Expression Studies in Common Carp and Tilapia. Mar. Environ. Res.46(1-5): 563-566.
Zinc chloride (ZnCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	2300	NA	NR	ug/L	LAB	1980. Qureshi, S.A., and A.B. Saksena. The Acute Toxicity of Some Heavy Metals to Tilapia mossambica (Peters). Aqua Sci. Tech. Reviews (India)1: 19-20.
Zinc chloride (ZnCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1980. Qureshi, S.A., and A.B. Saksena. The Acute Toxicity of Some Heavy Metals to Tilapia mossambica (Peters). Aqua Sci. Tech. Reviews (India)1: 19-20.
Zinc chloride (ZnCl2)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1980. Qureshi, S.A., and A.B. Saksena. The Acute Toxicity of Some Heavy Metals to Tilapia mossambica (Peters). Aqua Sci. Tech. Reviews (India)1: 19-20.
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	4200		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	%	LAB	1995. Sheela, M., G. Mallika, and S. Muniandy. Impact of Zinc on the Energetics of Feeding and Biochemical Status of Tissues in the Fish Oreochromis mossambicus. Environ. Ecol.13(2): 418-422.
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	4200	NA	NR	ug/L	LAB	1992. James, R., K. Sampath, and K.P. Ponmani. Effect of Metal Mixtures on Activity of Two Respiratory Enzymes and Their Recovery in Oreochromis mossambicus (Peters). Indian J. Exp. Biol.30(6): 496-499.
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	12.625	NA	NR	ug/L	LAB	1989. Gaikwad, S.A.. Effects of Mixture and Three Individual Heavy Metals on Susceptibility of Three Fresh Water Fishes. Pollut. Res.8(1): 33-35.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	25000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	39000*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	7600*	NA	NR	ug/L	LAB	1984. Mukhopadhyay, M.K., and S.K. Konar. Toxicity of Copper, Zinc and Iron to Fish, Plankton and Worm. Geobios11: 204-207.
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	LC84	Not Reported	T	6150		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Zinc	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	90920		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	20457		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	20457		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	68190		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	7000		NC	ug/L	LAB	1991. James, R., K. Sampath, V. Sivakumar, and S. Manthiramoorthy. Individual and Combined Effects of Heavy Metals on Survival and Biochemistry of Oreochromis mossambicus. Indian J. Fish.38(1): 49-54.
Sulfuric acid, Zinc salt (1:1)	Mozambique Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	600		NC	ug/L	LAB	1998. Sampath, K., R. James, and K.M.A. Ali. Effects of Copper and Zinc on Blood Parameters and Prediction of their Recovery in Oreochromis mossambicus (Pisces : Cichilidae). Indian J. Fish.45(2): 129-139.
Zinc	Mozambique Tilapia	Fish	Fresh	Reproduction	LOEL	Not Reported	T	56825		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Reproduction	NR	Not Reported	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Reproduction	NR	Not Reported	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Reproduction	NR	Not Reported	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mozambique Tilapia	Fish	Fresh	Reproduction	NR	Not Reported	T	NR		NC	ug/L	FIELDA	1983. Mukhopadhyay, M.K.. Effect of Zinc Pollution on Fish and Aquatic Ecosystem. Environ. Ecol.1(2): 89-96.
Zinc	Mullet	Fish	NR	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1993. Hou, L., H. Zhao, and Y. Wu. Acute Intoxication of Some Heavy Metals to Mugil So-luy and the Avoidance Reaction of Mugil So-luy. Oceanol. Limnol. Sin. (Haiyang Yu Huzhao)24(5): 507-510.
Zinc	Mullet	Fish	NR	Mortality	LC50	Not Reported	T	13500	NA	NR	ug/L	LAB	1993. Hou, L., H. Zhao, and Y. Wu. Acute Intoxication of Some Heavy Metals to Mugil So-luy and the Avoidance Reaction of Mugil So-luy. Oceanol. Limnol. Sin. (Haiyang Yu Huzhao)24(5): 507-510.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	LC100	Not Reported	T	4500*	NA	NR	ug/L	LAB	1915. Thomas, A.. Effects of Certain Metallic Salts upon Fishes. Trans. Am. Fish. Soc.44: 120-124.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	LC50	Not Reported	T	1010		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	LC50	Not Reported	T	940		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	LOEL	Not Reported	T	11452		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	LOEL	Not Reported	T	784		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	LOEL	Not Reported	T	11452		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	LOEL	Not Reported	T	784		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	NOEL	Not Reported	T	609		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	NOEL	Not Reported	T	571		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	NOEL	Not Reported	T	571		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	NOEL	Not Reported	T	609		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	11452		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.
Sulfuric acid, Zinc salt (1:1)	Mummichog	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	68		NC	ug/L	LAB	2006. Guy, C.P., A.E. Pinkney, and M.H. Taylor. Effects of Sediment-Bound Zinc Contamination on Early Life Stages of the Mummichog (Fundulus heteroclitus L.) in the Christina Watershed, Delaware, USA. Environ. Toxicol. Chem.25(5): 1305-1311.
Zinc chloride (ZnCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.
Zinc chloride (ZnCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	uM	LAB	2008. Atli, G., and M. Canli. Responses of Metallothionein and Reduced Glutathione in a Freshwater Fish Oreochromis niloticus Following Metal Exposures. Environ. Toxicol. Pharmacol.25(1): 33-38.
Zinc chloride (ZnCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.
Zinc chloride (ZnCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEC	Whole Organism	T	20	NR	NR	uM	LAB	2008. Atli, G., and M. Canli. Responses of Metallothionein and Reduced Glutathione in a Freshwater Fish Oreochromis niloticus Following Metal Exposures. Environ. Toxicol. Pharmacol.25(1): 33-38.
Zinc chloride (ZnCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEL	Whole Organism	T	1000		NC	ug/L	LAB	2005. Eroglu, K., G. Atli, and M. Canli. Effects of Metal (Cd, Cu, Zn) Interactions on the Profiles of Metallothionein-Like Proteins in the Nile Fish Oreochromis niloticus. Bull. Environ. Contam. Toxicol.75(2): 390-399.
Zinc chloride (ZnCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEL	Whole Organism	T	20		NC	uM	LAB	2007. Atli, G., and M. Canli. Enzymatic Responses to Metal Exposures in a Freshwater Fish Oreochromis niloticus. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.145(2): 282-287.
Zinc chloride (ZnCl2)	Nile Tilapia	Fish	Fresh	Growth	NOEL	Whole Organism	T	20		NC	uM	LAB	2007. Atli, G., and M. Canli. Enzymatic Responses to Metal Exposures in a Freshwater Fish Oreochromis niloticus. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.145(2): 282-287.
Zinc	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	86410	NA	NR	ug/L	LAB	1982. Somsiri, C.. Acute Toxicity of Mercury, Copper and Zinc to the Nile tilapia. Thai Fish. Gaz.35(3): 313-318.
Zinc	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	74760	NA	NR	ug/L	LAB	1982. Somsiri, C.. Acute Toxicity of Mercury, Copper and Zinc to the Nile tilapia. Thai Fish. Gaz.35(3): 313-318.
Zinc	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	65550	NA	NR	ug/L	LAB	1982. Somsiri, C.. Acute Toxicity of Mercury, Copper and Zinc to the Nile tilapia. Thai Fish. Gaz.35(3): 313-318.
Sulfuric acid, Zinc salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	24590	NA	NR	ug/L	LAB	1991. Annune, P.A., A.A. Oladimeji, and S. Ebele. Acute Toxicity of Zinc to the Fingerlings of Clarias lazera Cuvier and Valenciennes and Oreochromis niloticus (Trewavas). J. Aquat. Sci.6: 19-22.
Zinc chloride (ZnCl2)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	50		NC	ug/L	LAB	2008. Oner, M., G. Atli, and M. Canli. Changes in Serum Biochemical Parameters of Freshwater Fish Oreochromis niloticus Following Prolonged Metal (Ag, Cd, Cr, Cu, Zn) Exposures. Environ. Toxicol. Chem.27(2): 360-366.
Zinc chloride (ZnCl2)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	10000	NR	NR	ug/L	LAB	1999. Kargin, F., and H.Y. Cogun. Metal Interactions During Accumulation and Elimination of Zinc and Cadmium in Tissues of the Freshwater Fish Tilapia nilotica. Bull. Environ. Contam. Toxicol.63(4): 511-519.
Zinc chloride (ZnCl2)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Oner, M., G. Atli, and M. Canli. Effects of Metal (Ag, Cd, Cr, Cu, Zn) Exposures on Some Enzymatic and Non-Enzymatic Indicators in the Liver of Oreochromis niloticus. Bull. Environ. Contam. Toxicol.82(3): 317-321.
Sulfuric acid, Zinc salt (1:1)	Nile Tilapia	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	4000		NC	ug/L	LAB	1994. Annune, P.A., T.T. Iyaniwura, S. Ebele, and A.A. Oladimeji. Effects of Sublethal Concentrations of Zinc on Haematological Parameters of Freshwater Fishes, Clarias gariepinus (Burch) and Oreochromis niloticus (Trewavas). J. Aquaric. Aquat. Sci.9: 1-6.
Zinc chloride (ZnCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3498	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3693	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Zinc chloride (ZnCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	2948	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Zinc chloride (ZnCl2)	Northern Squawfish	Fish	Fresh	Mortality	LC50	Not Reported	T	3650	NA	NR	ug/L	LAB	1980. Andros, J.D., and R.R. Garton. Acute Lethality of Copper, Cadmium, and Zinc to Northern Squawfish. Trans. Am. Fish. Soc.109(2): 235-238.
Sulfuric acid, Zinc salt (1:1)	Pearlspot	Fish	Fresh	Mortality	LC50	Not Reported	T	10.5	NA	NR	ug/L	LAB	1989. Gaikwad, S.A.. Effects of Mixture and Three Individual Heavy Metals on Susceptibility of Three Fresh Water Fishes. Pollut. Res.8(1): 33-35.
Sulfuric acid, Zinc salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Perch	Fish	NR	Mortality	LC50	Not Reported	T	8180		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Perch	Fish	NR	Mortality	LC50	Not Reported	T	7490		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Perch	Fish	NR	Mortality	LC50	Not Reported	T	6940		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Zinc	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	25100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	21900	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	Pumpkinseed	Fish	Fresh	Mortality	LC50	Not Reported	T	20100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc nitrate	Pumpkinseed	Fish	Fresh	Mortality	LC50*	Not Reported	T	25200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	Pumpkinseed	Fish	Fresh	Mortality	LC50*	Not Reported	T	21800	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	Pumpkinseed	Fish	Fresh	Mortality	LC50*	Not Reported	T	20000	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	EC10	Whole Organism	D	300		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	EC10	Whole Organism	D	199		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	EC20	Whole Organism	D	387		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	IC25	Whole Organism	T	258.4		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	IC25	Whole Organism	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	2310		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	345		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	351		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	D	365		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	D	365		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Van Leeuwen, C.J., E.M.M. Grootelaar, and G. Niebeek. Fish Embryos as Teratogenicity Screens: A Comparison of Embryotoxicity Between Fish and Birds. Ecotoxicol. Environ. Saf.20(1): 42-52.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Not Reported	T	320		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	250		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	LOEC	Whole Organism	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	MATC	Whole Organism	D	279		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	MATC	Whole Organism	D	279		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	MATC	Not Reported	T	219		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	D	199		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	D	370		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	D	696		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	D	771		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	D	324		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	159		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	166		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	974		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	D	214		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	D	214		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Not Reported	T	150		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	125		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEC	Whole Organism	T	1035800	NR	NR	ug/L	LAB	2006. Kjoss, V.A., C.M. Wood, and D.G. McDonald. Effects of Different Ligands on the Bioaccumulation and Subsequent Depuration of Dietary Cu and Zn in Juvenile Rainbow Trout (Oncorhynchus mykiss). Can. J. Fish. Aquat. Sci.63(2): 412-422.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NOEL	Whole Organism	T	1		NC	uCI/g org	LAB	1966. Nakatani, R.E.. Biological Response of Rainbow Trout (Salmo gairdneri) Ingesting Zinc-65. In: A.Guillon (Ed.), Proc.on the Disposal of Radioactive Wastes in Seas, Ocean, and Surface Waters, Int.Atomic Energy Agency (IAEA), Vienna, Austria: 809-823.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NOEL	Whole Organism	T	234		NC	ug/L	LAB	2000. McGeer, J.C., C. Szebedinszky, D.G. McDonald, and C.M. Wood. Effects of Chronic Sublethal Exposure to Waterborne Cu, Cd or Zn in Rainbow Trout 1: Iono-Regulatory Disturbance and Metabolic Costs. Aquat. Toxicol.50(3): 231-243.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	uM	LAB	1983. Leland, H.V.. Ultrastructural Changes in the Hepatocytes of Juvenile Rainbow Trout and Mature Brown Trout Exposed to Copper or Zinc. Environ. Toxicol. Chem.2(3): 353-368.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1984. Roch, M., and J.A. McCarter. Hepatic Metallothionein Production and Resistance to Heavy Metals by Rainbow Trout (Salmo gairdneri)-II. Held in a Series of Contaminated Lakes. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.77(1): 77-82.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Zinc	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1971. Goettl, J.P.. Water Pollution Studies. Fed.Aid Proj.No.F-33-R-6, Colorado Game, Fish and Parks Div., Div.Wildl., Ft.Collins, CO: 130 p..
Zinc	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Gundogdu, A., and M. Erdem. The Accumulation of the Heavy Metals (Copper and Zinc) in the Tissues of Rainbow Trout (Onchorhyncus mykiss, Walbaum, 1792). J. Fish. Sci.2(1): 41-50.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Growth	NR		T	58800	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Rainbow Trout of Zinc in White Fish Meal and of Various Zinc Compounds. Nippon Suisan Gakkaishi53(4): 595-599.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	800	NR	NR	ug/L	LAB	1968. Brown, V.M., V.V. Mitrovic, and G.T.C. Stark. Effects of Chronic Exposure to Zinc on Toxicity of a Mixture of Detergent and Zinc. Water Res.2: 255-263.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Hogstrand, C., S.D. Reid, and C.M. Wood. Ca2+ Versus Zn2+ Transport in the Gills of Freshwater Rainbow Trout and the Cost of Adaptation to Waterborne Zn2+. J. Exp. Biol.198: 337-348.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	800	NR	NR	ug/L	LAB	1968. Brown, V.M., V.V. Mitrovic, and G.T.C. Stark. Effects of Chronic Exposure to Zinc on Toxicity of a Mixture of Detergent and Zinc. Water Res.2: 255-263.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Alsop, D.H., J.C. McGeer, D.G. McDonald, and C.M. Wood. Costs of Chronic Waterborne Zinc Exposure and the Consequences of Zinc Acclimation on the Gill/Zinc Interactions of Rainbow Trout in Hard and Soft Water. Environ. Toxicol. Chem.18(5): 1014-1025.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Alsop, D.H., J.C. McGeer, D.G. McDonald, and C.M. Wood. Costs of Chronic Waterborne Zinc Exposure and the Consequences of Zinc Acclimation on the Gill/Zinc Interactions of Rainbow Trout in Hard and Soft Water. Environ. Toxicol. Chem.18(5): 1014-1025.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	800	NR	NR	ug/L	LAB	1968. Brown, V.M., V.V. Mitrovic, and G.T.C. Stark. Effects of Chronic Exposure to Zinc on Toxicity of a Mixture of Detergent and Zinc. Water Res.2: 255-263.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Watson, T.A., and B.A. McKeown. The Activity of delta 5-3 beta Hydroxysteriod Dehydrogenase Enzyme in the Interrenal Tissue of Rainbow Trout (Salmo gairdneri Richardson). Bull. Environ. Contam. Toxicol.16(2): 173-181.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Whole Organism	T	NR	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	2020000	NA	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-11, DNR, Boulder, CO: 58 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR	Not Reported	T	8200000	NA	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., and P.H. Davies. Water Pollution Studies. Job Progress Report, Federal Aid Project F-33-R-11, DNR, Boulder, CO: 58 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	117000	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Rainbow Trout of Zinc in White Fish Meal and of Various Zinc Compounds. Nippon Suisan Gakkaishi53(4): 595-599.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	49100	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Rainbow Trout of Zinc in White Fish Meal and of Various Zinc Compounds. Nippon Suisan Gakkaishi53(4): 595-599.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	80200	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Rainbow Trout of Zinc in White Fish Meal and of Various Zinc Compounds. Nippon Suisan Gakkaishi53(4): 595-599.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	90000	NA	NR	ug/L	LAB	1983. Wekell, J.C., K.D. Shearer, and C.R. Houle. High Zinc Supplementation of Rainbow Trout Diets. Prog. Fish-Cult.45(3): 144-147.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	1120	NA	NR	ug/L	LAB	1976. Watson, T.A., and B.A. McKeown. The Effect of Sublethal Concentrations of Zinc on Growth and Plasma Glucose Levels in Rainbow Trout, Salmo gairdneri (Richardson). J. Wildl. Dis.12(2): 263-270.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Growth	NR		T	520	NA	NR	ug/L	LAB	1976. Watson, T.A., and B.A. McKeown. The Effect of Sublethal Concentrations of Zinc on Growth and Plasma Glucose Levels in Rainbow Trout, Salmo gairdneri (Richardson). J. Wildl. Dis.12(2): 263-270.
Zinc nitrate	Rainbow Trout	Fish	Fresh	Growth	NR		T	50000	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Rainbow Trout of Zinc in White Fish Meal and of Various Zinc Compounds. Nippon Suisan Gakkaishi53(4): 595-599.
Zinc nitrate	Rainbow Trout	Fish	Fresh	Growth	NR		T	58600	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Rainbow Trout of Zinc in White Fish Meal and of Various Zinc Compounds. Nippon Suisan Gakkaishi53(4): 595-599.
Zinc nitrate	Rainbow Trout	Fish	Fresh	Growth	NR		T	81100	NA	NR	ug/L	LAB	1987. Satoh, S., T. Takeuchi, and T. Watanabe. Availability to Rainbow Trout of Zinc in White Fish Meal and of Various Zinc Compounds. Nippon Suisan Gakkaishi53(4): 595-599.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC10	Not Reported	D	147		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	EC10	Not Reported	D	88		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	D	185		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	D	219		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	D	259		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	D	578		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	D	902		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	103		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	104		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	171		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	290		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	312		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	337		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	34.5		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	38.4		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	46.1		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	67.9		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	73.6		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	83.2		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	99.1		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	99.1		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	55		NC	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC10	Not Reported	T	88		NC	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	1850		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	1970		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	337		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	406		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	582		NC	ug/L	LAB	2005. De Schamphelaere, K.A.C., S. Lofts, and C.R. Janssen. Bioavailability Models for Predicting Acute and Chronic Toxicity of Zinc to Algae, Daphnids, and Fish in Natural Surface Waters. Environ. Toxicol. Chem.24(5): 1190-1197.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9800	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	410	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2600	NA	NR	ug/L	LAB	1968. Water Pollution Research Board. Effects of Pollution on Fish: Chronic Toxicity of Ammonia to Rainbow Trout. In: Water Pollution Research 1967, Water Pollution Research Board, Dep.of Scientific and Industrial Research, H.M.Stationery Office, London: 56-65.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1968. Brown, V.M.. The Calculation of the Acute Toxicity of Mixtures of Poisons to Rainbow Trout. Water Res.2(10): 723-733.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3500	NA	NR	ug/L	LAB	1968. Brown, V.M.. The Calculation of the Acute Toxicity of Mixtures of Poisons to Rainbow Trout. Water Res.2(10): 723-733.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1760	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5900	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	790	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1000	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1190	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4520	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	560	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7210	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	830	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2.72	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1600	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5300	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	590	NA	NR	ug/L	LAB	1994. Kazlauskiene, N., A. Burba, and G. Svecevicius. Acute Toxicity of Five Galvanic Heavy Metals to Hydrobionts. Ekologija1: 33-36.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	410	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	320	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	380	NR	NR	ug/L	LAB	1986. Roch, M., and J.A. McCarter. Survival and Hepatic Metallothionein in Developing Rainbow Trout Exposed to a Mixture of Zinc, Copper, and Cadmium. Bull. Environ. Contam. Toxicol.36: 168-175.
Sulfuric acid, Zinc salt (1:1), Heptahydrate	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3340	NR	NR	ug/L	LAB	2000. Alsop, D.H., and C.M. Wood. Kinetic Analysis of Zinc Accumulation in the Gills of Juvenile Rainbow Trout: Effects of Zinc Acclimation and Implications for Biotic Ligand Modeling. Environ. Toxicol. Chem.19(7): 1911-1918.
Sulfuric acid, Zinc salt (1:1), Heptahydrate	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	103	NR	NR	ug/L	LAB	1999. Alsop, D.H., and C.M. Wood. Influence of Waterborne Cations on Zinc Uptake and Toxicity in Rainbow Trout, Oncorhynchus mykiss. Can. J. Fish. Aquat. Sci.56(11): 2112-2119.
Sulfuric acid, Zinc salt (1:1), Heptahydrate	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2615	NR	NR	ug/L	LAB	2000. Alsop, D.H., and C.M. Wood. Kinetic Analysis of Zinc Accumulation in the Gills of Juvenile Rainbow Trout: Effects of Zinc Acclimation and Implications for Biotic Ligand Modeling. Environ. Toxicol. Chem.19(7): 1911-1918.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	108		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1240		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	151		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	159		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	177		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1860		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	212		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	224		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	282		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	339		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	361		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	368		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	583		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	759		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	802		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1170		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	130		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1470		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1510		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	153		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	171		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	194		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	209		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	214		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2280		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2560		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	283		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	441		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	483		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	548		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	610		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	730		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	904		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	117		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	123		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	130		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	387		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	215	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3120	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1060	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1060	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	136	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	815	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	93	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1755	NR	NR	ug/L	LAB	1978. Chapman, G.A., and D.G. Stevens. Acutely Lethal Levels of Cadmium, Copper, and Zinc to Adult Male Coho Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 837-840.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	66	NA	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	671	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	97	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	107	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	132	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	141	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	181	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	191	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	204	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	212	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	226	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	246	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	251	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	271	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	297	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	344	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	469	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	95	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	12800	NR	NR	ug/L	LAB	2008. Gundogdu, A.. Acute Toxicity of Zinc and Copper for Rainbow Trout (Onchorhyncus mykiss). J. Fish. Sci.2(5): 711-721.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	169	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2170	NA	NR	ug/L	LAB	1990. Buhl, K.J., and S.J. Hamilton. Comparative Toxicity of Inorganic Contaminants Released by Placer Mining to Early Life Stages of Salmonids. Ecotoxicol. Environ. Saf.20(3): 325-342.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1120	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	109	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	114	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	124	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	150	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	184	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	198	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	23.9	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	257	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	26.8	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	27.3	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	28.2	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	329	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	33.3	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	37.2	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	53.3	NR	NR	ug/L	LAB	2002. Hansen, J.A., P.G. Welsh, J. Lipton, D. Cacela, and A.D. Dailey. Relative Sensitivity of Bull Trout (Salvelinus confluentus) and Rainbow Trout (Oncorhynchus mykiss) to Acute Exposures of Cadmium and Zinc. Environ. Toxicol. Chem.21(1): 67-75.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	58.8	NR	NR	ug/L	LAB	1999. Stratus Consulting Inc.. Sensitivity of Bull Trout (Salvelinus confluentus) to Cadmium and Zinc in Water Characteristic of the Coeur D'Alene River Basin: Acute Toxicity Report. Prepared for the U.S.EPA, Seattle, WA: 55 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	170	NA	NR	ug/L	LAB	1989. Anadu, D.I., G.A. Chapman, L.R. Curtis, and R.A. Tubb. Effect of Zinc Exposure on Subsequent Acute Tolerance to Heavy Metals in Rainbow Trout. Bull. Environ. Contam. Toxicol.43(3): 329-336.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	3960	NA	NR	ug/L	LAB	1985. Bradley, R.W., C. Duquesnay, and J.B. Sprague. Acclimation of Rainbow Trout, Salmo gairdneri Richardson, to Zinc: Kinetics and Mechanism of Enhanced Tolerance Induction. J. Fish Biol.27(4): 367-369.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	4200	NA	NR	ug/L	LAB	1985. Bradley, R.W., C. Duquesnay, and J.B. Sprague. Acclimation of Rainbow Trout, Salmo gairdneri Richardson, to Zinc: Kinetics and Mechanism of Enhanced Tolerance Induction. J. Fish Biol.27(4): 367-369.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	4850	NA	NR	ug/L	LAB	1985. Bradley, R.W., C. Duquesnay, and J.B. Sprague. Acclimation of Rainbow Trout, Salmo gairdneri Richardson, to Zinc: Kinetics and Mechanism of Enhanced Tolerance Induction. J. Fish Biol.27(4): 367-369.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	6230	NA	NR	ug/L	LAB	1985. Bradley, R.W., C. Duquesnay, and J.B. Sprague. Acclimation of Rainbow Trout, Salmo gairdneri Richardson, to Zinc: Kinetics and Mechanism of Enhanced Tolerance Induction. J. Fish Biol.27(4): 367-369.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	7260	NA	NR	ug/L	LAB	1985. Bradley, R.W., C. Duquesnay, and J.B. Sprague. Acclimation of Rainbow Trout, Salmo gairdneri Richardson, to Zinc: Kinetics and Mechanism of Enhanced Tolerance Induction. J. Fish Biol.27(4): 367-369.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	520	NA	NR	ug/L	LAB	1990. Van Leeuwen, C.J., E.M.M. Grootelaar, and G. Niebeek. Fish Embryos as Teratogenicity Screens: A Comparison of Embryotoxicity Between Fish and Birds. Ecotoxicol. Environ. Saf.20(1): 42-52.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	501	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	66	NA	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	97	NR	NR	ug/L	LAB	1986. Cusimano, R.F., D.F. Brakke, and G.A. Chapman. Effects of pH on the Toxicities of Cadmium, Copper, and Zinc to Steelhead Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.43(8): 1497-1503.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	555	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	278	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	93	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Toxicities of Cadmium, Copper, and Zinc to Four Juvenile Stages of Chinook Salmon and Steelhead. Trans. Am. Fish. Soc.107(6): 841-847.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
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Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	11100	NA	NR	ug/L	LAB	1985. Bradley, R.W., and J.B. Sprague. The Influence of pH, Water Hardness, and Alkalinity on the Acute Lethality of Zinc to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 731-736.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	880	NA	NR	ug/L	LAB	1985. Bradley, R.W., and J.B. Sprague. The Influence of pH, Water Hardness, and Alkalinity on the Acute Lethality of Zinc to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 731-736.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	110	D	110	ug/L	LAB	1985. Bradley, R.W., and J.B. Sprague. The Influence of pH, Water Hardness, and Alkalinity on the Acute Lethality of Zinc to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 731-736.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	170	D	160	ug/L	LAB	1985. Bradley, R.W., and J.B. Sprague. The Influence of pH, Water Hardness, and Alkalinity on the Acute Lethality of Zinc to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 731-736.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	190	D	180	ug/L	LAB	1985. Bradley, R.W., and J.B. Sprague. The Influence of pH, Water Hardness, and Alkalinity on the Acute Lethality of Zinc to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 731-736.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4460	D	4460	ug/L	LAB	1985. Bradley, R.W., and J.B. Sprague. The Influence of pH, Water Hardness, and Alkalinity on the Acute Lethality of Zinc to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 731-736.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4530	D	30	ug/L	LAB	1985. Bradley, R.W., and J.B. Sprague. The Influence of pH, Water Hardness, and Alkalinity on the Acute Lethality of Zinc to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 731-736.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5160	D	5120	ug/L	LAB	1985. Bradley, R.W., and J.B. Sprague. The Influence of pH, Water Hardness, and Alkalinity on the Acute Lethality of Zinc to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 731-736.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9950	D	9920	ug/L	LAB	1985. Bradley, R.W., and J.B. Sprague. The Influence of pH, Water Hardness, and Alkalinity on the Acute Lethality of Zinc to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 731-736.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1120	NA	NR	ug/L	LAB	1980. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale. In: C.Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, U.S.EPA, Cincinnati, OH: 519-534.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1120	NA	NR	ug/L	LAB	1980. Black, J.A., and W.J. Birge. An Avoidance Response Bioassay for Aquatic Pollutants. Res.Report No.123, Water Resour.Res.Inst., Univ.of Kentucky, Lexington, KY: 34-180490.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1979. Smith, M.J., and A.G. Heath. Acute Toxicity of Copper, Chromate, Zinc, and Cyanide to Freshwater Fish: Effect of Different Temperatures. Bull. Environ. Contam. Toxicol.22(1-2): 113-119.
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Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1963. Water Pollution Research Board. Effects of Pollution on Fish. In: Water Pollution Research 1962, Water Pollut.Res.Board, Dep.of Sci.and Ind.Res., H.M.Stationery Off., London, England: 76-83.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1963. Water Pollution Research Board. Effects of Pollution on Fish. In: Water Pollution Research 1962, Water Pollut.Res.Board, Dep.of Sci.and Ind.Res., H.M.Stationery Off., London, England: 76-83.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1963. Water Pollution Research Board. Effects of Pollution on Fish. In: Water Pollution Research 1962, Water Pollut.Res.Board, Dep.of Sci.and Ind.Res., H.M.Stationery Off., London, England: 76-83.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	504		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	105		NC	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	186		NC	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	175		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	263		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	530		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	378.9		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9000	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1240	NA	NR	ug/L	LAB	1976. McLeay, D.J.. A Rapid Method for Measuring the Acute Toxicity of Pulpmill Effluents and Other Toxicants to Salmonid Fish at Ambient Room Temperature. J. Fish. Res. Board Can.33(6): 1303-1311.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1560	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2800	NA	NR	ug/L	LAB	1978. Cairns, J.,Jr., A.L.,Jr. Buikema, A.G. Heath, and B.C. Parker. Effects of Temperature on Aquatic Organism Sensitivity to Selected Chemicals. Va.Water Resour.Res.Center, Bull.106, Office of Water Res.and Technol., OWRT Project B-084-VA, VA.Polytech.Inst.State Univ., Blacksburg, VA: 88 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3400	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4300	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7000	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9100	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9200	NA	NR	ug/L	LAB	1986. Shazili, N.A.M., and D. Pascoe. Variable Sensitivity of Rainbow Trout (Salmo gairdneri) Eggs and Alevins to Heavy Metals. Bull. Environ. Contam. Toxicol.36(3): 468-474.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4700	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	24200	NA	NR	ug/L	LAB	1990. Vykusova, B., and Z. Svobodova. Acute Toxicity of Standards to Fish (Akutni Toxicita Standardu pro Ryby). Bull. V. U. R. H. Vodnany26(3): 15-20.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	908*	NA	NR	ug/L	LAB	1970. Brown, V.M., and R.A. Dalton. The Acute Lethal Toxicity to Rainbow Trout of Mixtures of Copper, Phenol, Zinc and Nickel. J. Fish Biol.2(3): 211-216.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2460	NA	NR	ug/L	LAB	1964. Herbert, D.W.M., and J.M. Vandyke. The Toxicity to Fish of Mixtures of Poisons. II. Copper-Ammonia and Zinc-Phenol Mixtures. Ann. Appl. Biol.53(3): 415-421.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	1500	NR	NR	ug/L	LAB	1963. Herbert, D.W.M., and D.S. Shurben. A Preliminary Study of the Effect of Physical Activity on the Resistance of Rainbow Trout (Salmo gairdnerii Richardson) to Two Poisons. Ann. Appl. Biol.52: 321-326.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3800	NR	NR	ug/L	LAB	1963. Herbert, D.W.M., and D.S. Shurben. A Preliminary Study of the Effect of Physical Activity on the Resistance of Rainbow Trout (Salmo gairdnerii Richardson) to Two Poisons. Ann. Appl. Biol.52: 321-326.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NR	ug/L	LAB	1963. Water Pollution Research Board. Effects of Pollution on Fish. In: Water Pollution Research 1962, Water Pollut.Res.Board, Dep.of Sci.and Ind.Res., H.M.Stationery Off., London, England: 76-83.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NR	ug/L	LAB	1963. Water Pollution Research Board. Effects of Pollution on Fish. In: Water Pollution Research 1962, Water Pollut.Res.Board, Dep.of Sci.and Ind.Res., H.M.Stationery Off., London, England: 76-83.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NR	ug/L	LAB	1963. Water Pollution Research Board. Effects of Pollution on Fish. In: Water Pollution Research 1962, Water Pollut.Res.Board, Dep.of Sci.and Ind.Res., H.M.Stationery Off., London, England: 76-83.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	30800	NA	NR	ug/L	LAB	1988. Svobodova, Z., and B. Vykusova. Comparing the Sensitivity of Rainbow Trout and Rasbora heteromorpha to Various Toxic Substances (Porovnani Citlivosti Pstruha Duhoveho a Razbory Klinoskvrnne k Ruznym Cizorodym Latkam). Bull. V. U. R. H. Vodnany24(2): 14-19.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	3880	NA	NR	ug/L	LAB	1962. Water Pollution Research Board. Effects of Pollution on Fish: Toxicity of Mixtures of Zinc Sulphate and Ammonium Chloride. In: Water Pollution Research 1961, Water Pollution Research Board, Dep.of Scientific and Industrial Research, H.M.Stationery Office, London: 90-93.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2000	NA	NR	ug/L	LAB	1982. Lovegrove, S.M., and B. Eddy. Uptake and Accumulation of Zinc in Juvenile Rainbow Trout, Salmo gairdneri. Environ. Biol. Fishes7(3): 285-289.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Woodall, C., N. MacLean, and F. Crossley. Responses of Trout Fry (Salmo gairdneri) and Xenopus laevis Tadpoles to Cadmium and Zinc. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.89(1): 93-99.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	332	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	162	NR	NR	ug/L	LAB	1999. Alsop, D.H., J.C. McGeer, D.G. McDonald, and C.M. Wood. Costs of Chronic Waterborne Zinc Exposure and the Consequences of Zinc Acclimation on the Gill/Zinc Interactions of Rainbow Trout in Hard and Soft Water. Environ. Toxicol. Chem.18(5): 1014-1025.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	869	NR	NR	ug/L	LAB	1999. Alsop, D.H., J.C. McGeer, D.G. McDonald, and C.M. Wood. Costs of Chronic Waterborne Zinc Exposure and the Consequences of Zinc Acclimation on the Gill/Zinc Interactions of Rainbow Trout in Hard and Soft Water. Environ. Toxicol. Chem.18(5): 1014-1025.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2720	NR	NR	ug/L	LAB	1974. Sinley, J.R., J.P.,Jr. Goettl, and P.H. Davies. The Effects of Zinc on Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Bull. Environ. Contam. Toxicol.12(2): 193-201.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	430	NR	NR	ug/L	LAB	1974. Sinley, J.R., J.P.,Jr. Goettl, and P.H. Davies. The Effects of Zinc on Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Bull. Environ. Contam. Toxicol.12(2): 193-201.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	7210	NR	NR	ug/L	LAB	1974. Sinley, J.R., J.P.,Jr. Goettl, and P.H. Davies. The Effects of Zinc on Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Bull. Environ. Contam. Toxicol.12(2): 193-201.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2400	NA	NR	ug/L	LAB	1987. Meisner, J.D., and W.Q. Hum. Acute Toxicity of Zinc to Juvenile and Subadult Rainbow Trout, Salmo gairdneri. Bull. Environ. Contam. Toxicol.39(5): 898-902.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2600	NA	NR	ug/L	LAB	1987. Meisner, J.D., and W.Q. Hum. Acute Toxicity of Zinc to Juvenile and Subadult Rainbow Trout, Salmo gairdneri. Bull. Environ. Contam. Toxicol.39(5): 898-902.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	280	NA	NR	ug/L	LAB	1976. McLeay, D.J.. A Rapid Method for Measuring the Acute Toxicity of Pulpmill Effluents and Other Toxicants to Salmonid Fish at Ambient Room Temperature. J. Fish. Res. Board Can.33(6): 1303-1311.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1978. British, Columbia Research. Avoidance Reactions of Salmonids to Pulpmill Effluents. Environ.Can., Environ.Prot.Serv., Coop.Pollut.Abatement Res., CPAR Project Rep.688-1: 36.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1978. British, Columbia Research. Avoidance Reactions of Salmonids to Pulpmill Effluents. Environ.Can., Environ.Prot.Serv., Coop.Pollut.Abatement Res., CPAR Project Rep.688-1: 36.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	560	NA	NR	ug/L	LAB	1984. Spry, D.J., and C.M. Wood. Acid-Base, Plasma Ion and Blood Gas Changes in Rainbow Trout During Short Term Toxic Zinc Exposure. J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.154(2): 149-158.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	670	NA	NR	ug/L	LAB	1984. Spry, D.J., and C.M. Wood. Acid-Base, Plasma Ion and Blood Gas Changes in Rainbow Trout During Short Term Toxic Zinc Exposure. J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.154(2): 149-158.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	500*	NA	NR	ug/L	LAB	1982. Qureshi, A.A., K.W. Flood, S.R. Thompson, S.M. Janhurst, C.S. Inniss, and D.A. Rokosh. Comparison of a Luminescent Bacterial Test with Other Bioassays for Determining Toxicity of Pure Compounds and Complex Effluents. In: J.G.Pearson, R.B.Foster and W.E.Bishop (Eds.), Aquatic Toxicology and Hazard Assessment, 5th Confrence, ASTM STP 766, Philadelphia, PA: 179-195.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	135	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	135	NR	NR	ug/L	LAB	1974. Sinley, J.R., J.P.,Jr. Goettl, and P.H. Davies. The Effects of Zinc on Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Bull. Environ. Contam. Toxicol.12(2): 193-201.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4600	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	433	NR	NR	ug/L	LAB	1993. Hickie, B.E., N.J. Hutchinson, D.G. Dixon, and P.V. Hodson. Toxicity of Trace Metal Mixtures to Alevin Rainbow Trout (Oncorhynchus mykiss) and Larval Fathead Minnow (Pimephales promelas) in Soft, Acidic Water. Can. J. Fish. Aquat. Sci.50: 1348-1355.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5400	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	810	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	380	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	340	NA	NR	ug/L	LAB	1983. Skidmore, J.F., and I.C. Firth. Acute Sensitivity of Selected Australian Freshwater Animals to Copper and Zinc. Tech.Pap.No.81, Aust.Water Resour.Council, Dep.Resour.Energy, Australian Gov.Publ.Serv., Canberra, Australia: 129 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	9000	NA	NR	ug/L	LAB	1974. Solbe, J.F.D.. The Toxicity of Zinc Sulfate to Rainbow Trout in Very Hard Water. Water Res.8(6): 389-391.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6600	NA	NR	ug/L	LAB	1974. Solbe, J.F.D.. The Toxicity of Zinc Sulfate to Rainbow Trout in Very Hard Water. Water Res.8(6): 389-391.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	6000	NA	NR	ug/L	LAB	1974. Solbe, J.F.D.. The Toxicity of Zinc Sulfate to Rainbow Trout in Very Hard Water. Water Res.8(6): 389-391.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	5300	NA	NR	ug/L	LAB	1974. Solbe, J.F.D.. The Toxicity of Zinc Sulfate to Rainbow Trout in Very Hard Water. Water Res.8(6): 389-391.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4760	NA	NR	ug/L	LAB	1974. Solbe, J.F.D.. The Toxicity of Zinc Sulfate to Rainbow Trout in Very Hard Water. Water Res.8(6): 389-391.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	1910	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	2510	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	2960	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	370	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	517	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	D	756	NA	NR	ug/L	LAB	1978. Holcombe, G.W., and R.W. Andrew. The Acute Toxicity of Zinc to Rainbow and Brook Trout: Comparisons in Hard and Soft Water. EPA-600/3-78-094, U.S.EPA, Duluth, MN.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50	Not Reported	T	4760	NA	NR	ug/L	LAB	1974. Solbe, J.F.D.. The Toxicity of Zinc Sulfate to Rainbow Trout in Very Hard Water. Water Res.8(6): 389-391.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	NR	Mortality	LC50	Not Reported	T	6470		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	NR	Mortality	LC50	Not Reported	T	4750		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	NR	Mortality	LC50	Not Reported	T	4120		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	NR	Mortality	LC50	Not Reported	T	3790		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	2400	NA	NR	ug/L	LAB	1964. Herbert, D.W.M., and D.S. Shurben. The Toxicity to Fish of Mixtures of Poisons I. Salts of Ammonia and Zinc. Ann. Appl. Biol.53: 33-41.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	3860	NA	NR	ug/L	LAB	1964. Herbert, D.W.M., and D.S. Shurben. The Toxicity to Fish of Mixtures of Poisons I. Salts of Ammonia and Zinc. Ann. Appl. Biol.53: 33-41.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	910	NA	NR	ug/L	LAB	1964. Herbert, D.W.M., and D.S. Shurben. The Toxicity to Fish of Mixtures of Poisons I. Salts of Ammonia and Zinc. Ann. Appl. Biol.53: 33-41.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	1190	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	240	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	410	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	430	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	4520	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	560	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	7210	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	810	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	830	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC50*	Not Reported	T	NR	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC90	Not Reported	T	205		NC	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LC90	Not Reported	T	393		NC	ug/L	LAB	1980. Davies, P.H.. Water Pollution Studies. Investigations on the Toxicity of Metals to Fish. Federal Aid in Fish and Wildl.s Restoration, Job Progress Rep.No.F-33-R-15, Colorado Div.of Wildl., Ft.Collins, CO: 38 p..
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	695	NA	NR	ug/L	LAB	1985. Stubblefield, W.A., B.L. Steadman, T.W. LaPoint, and H.L. Bergman. Affects of Acclimation upon the Toxicity of Zinc, Cadmium and Phenol on Adult and Fry Rainbow Trout. Am. Fish. Soc. Annu. Meet.115: 3.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	680	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	2476	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	2818	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	695	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	3077	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	3090	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LETC	Not Reported	T	3004	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	430	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	71	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	3600	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	0.34	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	130	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	3200	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	800	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	110	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	990	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	260	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	640	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	162		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	166		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1670		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	173		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	2310		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	256		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	338		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	351		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	356		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	363		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	371		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	538		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	665		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	800		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	117		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	D	117		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Van Leeuwen, C.J., E.M.M. Grootelaar, and G. Niebeek. Fish Embryos as Teratogenicity Screens: A Comparison of Embryotoxicity Between Fish and Birds. Ecotoxicol. Environ. Saf.20(1): 42-52.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	320		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	500		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	LOEC	Not Reported	T	251	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Zinc	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	219		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1974. Sinley, J.R., J.P.,Jr. Goettl, and P.H. Davies. The Effects of Zinc on Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Bull. Environ. Contam. Toxicol.12(2): 193-201.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1974. Sinley, J.R., J.P.,Jr. Goettl, and P.H. Davies. The Effects of Zinc on Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Bull. Environ. Contam. Toxicol.12(2): 193-201.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1974. Sinley, J.R., J.P.,Jr. Goettl, and P.H. Davies. The Effects of Zinc on Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Bull. Environ. Contam. Toxicol.12(2): 193-201.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	MATC	Not Reported	T	NR	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	36	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	140	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	320	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	151		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	157		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	159		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	165		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	169		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	256		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	401		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	45.4		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	48		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	78.9		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	786		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	90.3		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	95.1		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	974		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	31.5		NC	ug/L	LAB	2004. De Schamphelaere, K.A.C., and C.R. Janssen. Bioavailability and Chronic Toxicity of Zinc to Juvenile Rainbow Trout (Oncorhynchus mykiss): Comparison with Other Fish Species and Development of a Biotic Ligand Model. Environ. Sci. Technol.38(23): 6201-6209.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	150		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	NR		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	250		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NOEC	Not Reported	T	136	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	uM	LAB	1983. Leland, H.V.. Ultrastructural Changes in the Hepatocytes of Juvenile Rainbow Trout and Mature Brown Trout Exposed to Copper or Zinc. Environ. Toxicol. Chem.2(3): 353-368.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1984. Roch, M., and J.A. McCarter. Hepatic Metallothionein Production and Resistance to Heavy Metals by Rainbow Trout (Salmo gairdneri)-II. Held in a Series of Contaminated Lakes. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.77(1): 77-82.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1994. Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. Dietary and Waterborne Exposure of Rainbow Trout (Oncorhynchus mykiss) to Copper, Cadmium, Lead and Zinc Using a Live Diet. Environ. Toxicol. Chem.13(12): 2031-2041.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1713	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	837	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2025	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1804	NR	NR	ug/L	LAB	1999. Stubblefield, W.A., B.L. Steadman, T.W. La Point, and H.L. Bergman. Acclimation-Induced Changes in the Toxicity of Zinc and Cadmium to Rainbow Trout. Environ. Toxicol. Chem.18(12): 2875-2881.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	100	NA	NR	ug/L	LAB	1980. Biegert, E.K., and V. Valkovic. Acute Toxicity and Accumulation of Heavy Metals in Aquatic Animals. Period. Biol.82(1): 25-31.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1250	NA	NR	ug/L	LAB	1987. Castren, M., and A. Oikari. Changes of the Liver UDP-Glucuronosyltransferase Activity in Trout (Salmo gairdneri Rich.) Acutely Exposed to Selected Aquatic Toxicants. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 357-360.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	148	NA	NR	ug/L	LAB	1982. Cairns, M.A., R.R. Garton, and R.A. Tubb. Use of Fish Ventilation Frequency to Estimate Chronically Safe Toxicant Concentrations. Trans. Am. Fish. Soc.111(1): 70-77.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	262	NA	NR	ug/L	LAB	1982. Cairns, M.A., R.R. Garton, and R.A. Tubb. Use of Fish Ventilation Frequency to Estimate Chronically Safe Toxicant Concentrations. Trans. Am. Fish. Soc.111(1): 70-77.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	444	NA	NR	ug/L	LAB	1982. Cairns, M.A., R.R. Garton, and R.A. Tubb. Use of Fish Ventilation Frequency to Estimate Chronically Safe Toxicant Concentrations. Trans. Am. Fish. Soc.111(1): 70-77.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	819	NA	NR	ug/L	LAB	1982. Cairns, M.A., R.R. Garton, and R.A. Tubb. Use of Fish Ventilation Frequency to Estimate Chronically Safe Toxicant Concentrations. Trans. Am. Fish. Soc.111(1): 70-77.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	86	NA	NR	ug/L	LAB	1982. Cairns, M.A., R.R. Garton, and R.A. Tubb. Use of Fish Ventilation Frequency to Estimate Chronically Safe Toxicant Concentrations. Trans. Am. Fish. Soc.111(1): 70-77.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	87900	D	40	ug/L	LAB	1985. Bradley, R.W., and J.B. Sprague. The Influence of pH, Water Hardness, and Alkalinity on the Acute Lethality of Zinc to Rainbow Trout (Salmo gairdneri). Can. J. Fish. Aquat. Sci.42: 731-736.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1987. MacLean, N., C. Woodall, and F. Crossley. Injection of the Mouse MT-1 Gene into Rainbow Trout Eggs and Assay of Trout Fry for Resistance to Cadmium and Zinc Toxicity. In: J.H.R.Kagi and Y.Kojima (Eds.), Experientia Suppl., Volume 52, Metallothionein II, 2nd Int.Meet.on Metallothionein and Other Low Molecular Weight Metal-Binding Proteins, Aug.21-24, 1985, Zurich, Switzerland, Birkhaeuser Verlag, Basel, Switzerland: 471.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1987. MacLean, N., C. Woodall, and F. Crossley. Injection of the Mouse MT-1 Gene into Rainbow Trout Eggs and Assay of Trout Fry for Resistance to Cadmium and Zinc Toxicity. In: J.H.R.Kagi and Y.Kojima (Eds.), Experientia Suppl., Volume 52, Metallothionein II, 2nd Int.Meet.on Metallothionein and Other Low Molecular Weight Metal-Binding Proteins, Aug.21-24, 1985, Zurich, Switzerland, Birkhaeuser Verlag, Basel, Switzerland: 471.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1987. MacLean, N., C. Woodall, and F. Crossley. Injection of the Mouse MT-1 Gene into Rainbow Trout Eggs and Assay of Trout Fry for Resistance to Cadmium and Zinc Toxicity. In: J.H.R.Kagi and Y.Kojima (Eds.), Experientia Suppl., Volume 52, Metallothionein II, 2nd Int.Meet.on Metallothionein and Other Low Molecular Weight Metal-Binding Proteins, Aug.21-24, 1985, Zurich, Switzerland, Birkhaeuser Verlag, Basel, Switzerland: 471.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1987. MacLean, N., C. Woodall, and F. Crossley. Injection of the Mouse MT-1 Gene into Rainbow Trout Eggs and Assay of Trout Fry for Resistance to Cadmium and Zinc Toxicity. In: J.H.R.Kagi and Y.Kojima (Eds.), Experientia Suppl., Volume 52, Metallothionein II, 2nd Int.Meet.on Metallothionein and Other Low Molecular Weight Metal-Binding Proteins, Aug.21-24, 1985, Zurich, Switzerland, Birkhaeuser Verlag, Basel, Switzerland: 471.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1966. Grande, M.. Effect of Copper and Zinc on Salmonid Fishes. Adv. Water Pollut. Res.3(1): 97-111.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Alsop, D.H., J.C. McGeer, D.G. McDonald, and C.M. Wood. Costs of Chronic Waterborne Zinc Exposure and the Consequences of Zinc Acclimation on the Gill/Zinc Interactions of Rainbow Trout in Hard and Soft Water. Environ. Toxicol. Chem.18(5): 1014-1025.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Alsop, D.H., J.C. McGeer, D.G. McDonald, and C.M. Wood. Costs of Chronic Waterborne Zinc Exposure and the Consequences of Zinc Acclimation on the Gill/Zinc Interactions of Rainbow Trout in Hard and Soft Water. Environ. Toxicol. Chem.18(5): 1014-1025.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	96	NA	NR	ug/L	LAB	1982. Wagner, G.F., and B.A. McKeown. Changes in Plasma Insulin and Carbohydrate Metabolism of Zinc-Stressed Rainbow Trout, Salmo gairdneri. Can. J. Zool.60(9): 2079-2084.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	3000000	NA	NR	ug/L	LAB	1997. Kock, G., and F. Bucher. Accumulation of Zinc in Rainbow Trout (Oncorhynchus mykiss) after Waterborne and Dietary Exposure. Bull. Environ. Contam. Toxicol.58(2): 305-310.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1966. Grande, M.. Effect of Copper and Zinc on Salmonid Fishes. Adv. Water Pollut. Res.3(1): 97-111.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Kock, G., F. Bucher, and R. Hofer. Effects of Zinc in Water and Diet on Rainbow Trout: Accumulation and Histopathology. In: 12th ESCPB - Conference, Physiological and Biochemical Approaches to the Toxicological Assessment of Environmental Pollution, Royal Netherlands Chemical Society, Aug.27-31, 1990, Utrecht, Netherlands: 2 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	1600	NA	NR	ug/L	LAB	1997. Kock, G., and F. Bucher. Accumulation of Zinc in Rainbow Trout (Oncorhynchus mykiss) after Waterborne and Dietary Exposure. Bull. Environ. Contam. Toxicol.58(2): 305-310.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1961. Herbert, D.W.M.. Freshwater Fisheries and Pollution Control. Proc. Soc. Water Treat. Exam.10(2): 135-161.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	10000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	3000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	3000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	400	NA	NR	ug/L	LAB	1972. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Laboratory Studies: Water Pollution Studies. In: L.E.Yeager and D.T.Weber (Eds.), Colorado Fish.Res.Rev.No.7, Div.Game Fish Parks, Ft.Collins, CO: 36-49.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	3000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	2000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	4000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	800	NA	NR	ug/L	LAB	1985. Spry, D.J., and C.M. Wood. Ion Flux Rates, Acid-Base Status, and Blood Gases in Rainbow Trout, Salmo gairdneri, Exposed to Toxic Zinc in Natural Soft Water. Can. J. Fish. Aquat. Sci.42: 1332-1341.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR	Not Reported	T	120	NA	NR	ug/L	LAB	1977. Hodson, P.V., B.R. Blunt, D.J. Spry, and K. Austen. Evaluation of Erythrocyte delta-Amino Levulinic Acid Dehydratase Activity as a Short-Term Indicator in Fish of a Harmful Exposure to Lead. J. Fish. Res. Board Can.34(4): 501-508.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1270	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	547	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	830	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	920	NA	NR	ug/L	LAB	1974. Nehring, R.B.,Jr.. Acute Toxicity of a Zinc-Polluted Stream to Four Species of Salmonids. Bull. Environ. Contam. Toxicol.12(4): 464-469.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	1005		NC	ug/L	LAB	2007. Mebane, C.A., D.P. Hennessy, and F.S. Dillon. Developing Acute-to-Chronic Toxicity Ratios for Lead, Cadmium, and Zinc Using Rainbow Trout, a Mayfly, and a Midge. Water Air Soil Pollut.: 21 p..
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	7500	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	640		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	670		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	500		NC	ug/L	LAB	2007. Lazorchak, J.M., and M.E. Smith. Rainbow Trout (Oncorhynchus mykiss) and Brook Trout (Salvelinus fontinalis) 7-Day Survival and Growth Test Method. Arch. Environ. Contam. Toxicol.53(3): 397-405.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	1500	NA	NR	ug/L	LAB	1984. Spry, D.J., and C.M. Wood. Acid-Base, Plasma Ion and Blood Gas Changes in Rainbow Trout During Short Term Toxic Zinc Exposure. J. Comp. Physiol., B Biochem. Syst. Environ. Physiol.154(2): 149-158.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	6000	NA	NR	ug/L	LAB	1951. Goodman, J.R.. Toxicity of Zinc for Rainbow Trout (Salmo gairdnerii). Calif. Fish Game37(2): 191-194.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	526	NR	NR	ug/L	LAB	1973. Goettl, J.P.,Jr., J.R. Sinley, and P.H. Davies. Water Pollution Studies. Job Prog.Rep., Fed.Aid Proj.F-33-R-8, DNR, Denver, CO: 123 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	D	994	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	300	NR	NR	ug/L	LAB	1998. Aquatic Toxicology Group. Brenda Mines Sulphate and Molybdenum Toxicity Testing. Proj.Rep.No.2-11-825/826, Prepared for Noranda Mining and Exploration Inc., Brenda Mines Div., B.C.: 222 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1		NC	uCl/g org	LAB	1966. Nakatani, R.E.. Biological Response of Rainbow Trout (Salmo gairdneri) Ingesting Zinc-65. In: A.Guillon (Ed.), Proc.on the Disposal of Radioactive Wastes in Seas, Ocean, and Surface Waters, Int.Atomic Energy Agency (IAEA), Vienna, Austria: 809-823.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	10		NC	uCl/g org	LAB	1966. Nakatani, R.E.. Biological Response of Rainbow Trout (Salmo gairdneri) Ingesting Zinc-65. In: A.Guillon (Ed.), Proc.on the Disposal of Radioactive Wastes in Seas, Ocean, and Surface Waters, Int.Atomic Energy Agency (IAEA), Vienna, Austria: 809-823.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	11	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.2	NA	NR	uM	LAB	1983. Leland, H.V.. Ultrastructural Changes in the Hepatocytes of Juvenile Rainbow Trout and Mature Brown Trout Exposed to Copper or Zinc. Environ. Toxicol. Chem.2(3): 353-368.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	11	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	320	NR	NR	ug/L	LAB	1976. Goettl, J.P.,Jr., P.H. Davies, and J.R. Sinley. Water Pollution Studies. In: D.B.Cope (Ed.), Colorado Fish.Res.Rev.1972-1975, DOW-R-R-F72-75, Colorado Div.of Wildl., Boulder, CO: 68-75.
Zinc chloride (ZnCl2)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1.08	NA	NR	umol/L	LAB	1994. Zia, S., and D.G. McDonald. Role of the Gills and Gill Chloride Cells in Metal Uptake in the Freshwater-Adapted Rainbow Trout, Oncorhynchus mykiss. Can. J. Fish. Aquat. Sci.51(11): 2482-2492.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	234		NC	ug/L	LAB	2000. McGeer, J.C., C. Szebedinszky, D.G. McDonald, and C.M. Wood. Effects of Chronic Sublethal Exposure to Waterborne Cu, Cd or Zn in Rainbow Trout 1: Iono-Regulatory Disturbance and Metabolic Costs. Aquat. Toxicol.50(3): 231-243.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2.35		NC	umol/L	LAB	2006. Niyogi, S., and C.M. Wood. Interaction Between Dietary Calcium Supplementation and Chronic Waterborne Zinc Exposure in Juvenile Rainbow Trout, Oncorhynchus mykiss. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.143(1): 94-102.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	38		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	73		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	77		NC	ug/L	LAB	2007. Besser, J.M., C.A. Mebane, D.R. Mount, C.D. Ivey, J.L. Kunz, I.E. Greer, T.W. May, and C.G. Ingersoll. Sensitivity of Mottled Sculpins (Cottus bairdi) and Rainbow Trout (Oncorhynchus mykiss) to Acute and Chronic Toxicity of Cadmium, Copper, and Zinc. Environ. Toxicol. Chem.26(8): 1657-1665.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	D	151	NR	NR	ug/L	LAB	2008. Brinkman, S., and N. Vieira. Water Pollution Studies. Federal Aid Project F-243-R15, Job Progress Report, Colorado Div.of Wildlife, Fort Collins, Co: 38 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	320	NR	NR	ug/L	LAB	1974. Sinley, J.R., J.P.,Jr. Goettl, and P.H. Davies. The Effects of Zinc on Rainbow Trout (Salmo gairdneri) in Hard and Soft Water. Bull. Environ. Contam. Toxicol.12(2): 193-201.
Zinc	Rainbow Trout	Fish	Fresh	Reproduction	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1971. Goettl, J.P.. Water Pollution Studies. Fed.Aid Proj.No.F-33-R-6, Colorado Game, Fish and Parks Div., Div.Wildl., Ft.Collins, CO: 130 p..
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Reproduction	NR		T	20000	NA	NR	ug/L	LAB	1985. Billard, R., and P. Roubaud. The Effect of Metals and Cyanide on Fertilization in Rainbow Trout (Salmo gairdneri). Water Res.19(2): 209-214.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Reproduction	NR		T	20000	NA	NR	ug/L	LAB	1985. Billard, R., and P. Roubaud. The Effect of Metals and Cyanide on Fertilization in Rainbow Trout (Salmo gairdneri). Water Res.19(2): 209-214.
Sulfuric acid, Zinc salt (1:1)	Rainbow Trout	Fish	Fresh	Reproduction	NR		T	20000	NA	NR	ug/L	LAB	1985. Billard, R., and P. Roubaud. The Effect of Metals and Cyanide on Fertilization in Rainbow Trout (Salmo gairdneri). Water Res.19(2): 209-214.
Sulfuric acid, Zinc salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	83580	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	52410	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	50250	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	41150	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	35810	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Zinc chloride (ZnCl2)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Zinc chloride (ZnCl2)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	2920	NA	NR	ug/L	LAB	1996. Buhl, K.J., and S.J. Hamilton. Toxicity of Inorganic Contaminants, Individually and in Environmental Mixtures, to Three Endangered Fishes (Colorado Squawfish, Bonytail, and Razorback Sucker). Arch. Environ. Contam. Toxicol.30(1): 84-92.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	4100	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Zinc chloride (ZnCl2)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	6500	NA	NR	ug/L	LAB	1995. Hamilton, S.J.. Hazard Assessment of Inorganics to Three Endangered Fish in the Green River, Utah. Ecotoxicol. Environ. Saf.30(2): 134-142.
Sulfuric acid, Zinc salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	9800	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid, Zinc salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	9800	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid, Zinc salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	9800	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Sulfuric acid, Zinc salt (1:1)	Razorback Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	9800	NR	NR	ug/L	LAB	1997. Hamilton, S.J., and K.J. Buhl. Hazard Assessment of Inorganics, Individually and in Mixtures, to Two Endangered Fish in the San Juan River, New Mexico. Environ. Toxicol. Water Qual.12: 195-209.
Zinc	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	3700	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Zinc	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	2220	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Zinc	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	920	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Zinc	Red Sea Bream	Fish	NR	Mortality	LC50	Not Reported	T	444	NA	NR	ug/L	LAB	1991. Lan, W., and N. Chen. Acute Toxicity of Hg, Cu, Cd, Zn to Larvae of Red Sea Bream, Chrysophrys major. Mar. Sci.5: 56-60.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	17300	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	17300	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1967. Ball, I.R.. The Relative Susceptibilities of Some Species of Fresh-Water Fish to Poisons--II. Zinc. Water Res.1(11-12): 777-783.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	NR	Mortality	LC50	Not Reported	T	15920		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	NR	Mortality	LC50	Not Reported	T	13320		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Roach	Fish	NR	Mortality	LC50	Not Reported	T	11370		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Zinc	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	156000		NC	ug/L	LAB	2006. Loganathan, K., B. Velmurugan, J.H. Howrelia, M. Selvanayagam, and B.B. Patnaik. Zinc Induced Histological Changes in Brain and Liver of Labeo rohita (Ham.). J. Environ. Biol.27(1): 107-110.
Zinc	Rohu	Fish	Fresh	Mortality	LC50	Whole Organism	T	10910		NC	ug/L	LAB	2006. Shukla, V., M. Dhankhar, and K.V. Sastry. Heavy Metal Toxicity on Labeo rohita. J. Ecotoxicol. Environ. Monit.16(3): 247-250.
Sulfuric acid, Zinc salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	120700	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Respiration, Liver Glycogen and Bioaccumulation in Labeo rohita Exposed to Zinc. Indian J. Comp. Anim. Physiol.4(2): 79-84.
Sulfuric acid, Zinc salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	128000	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Respiration, Liver Glycogen and Bioaccumulation in Labeo rohita Exposed to Zinc. Indian J. Comp. Anim. Physiol.4(2): 79-84.
Sulfuric acid, Zinc salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	100000	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Respiration, Liver Glycogen and Bioaccumulation in Labeo rohita Exposed to Zinc. Indian J. Comp. Anim. Physiol.4(2): 79-84.
Sulfuric acid, Zinc salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	90000	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Respiration, Liver Glycogen and Bioaccumulation in Labeo rohita Exposed to Zinc. Indian J. Comp. Anim. Physiol.4(2): 79-84.
Sulfuric acid, Zinc salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	70000	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Respiration, Liver Glycogen and Bioaccumulation in Labeo rohita Exposed to Zinc. Indian J. Comp. Anim. Physiol.4(2): 79-84.
Sulfuric acid, Zinc salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	95000	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Respiration, Liver Glycogen and Bioaccumulation in Labeo rohita Exposed to Zinc. Indian J. Comp. Anim. Physiol.4(2): 79-84.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	65000	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Respiration, Liver Glycogen and Bioaccumulation in Labeo rohita Exposed to Zinc. Indian J. Comp. Anim. Physiol.4(2): 79-84.
Sulfuric acid, Zinc salt (1:1)	Rohu	Fish	Fresh	Mortality	LC50	Not Reported	T	77500	NA	NR	ug/L	LAB	1986. Bengeri, K.V., and H.S. Patil. Respiration, Liver Glycogen and Bioaccumulation in Labeo rohita Exposed to Zinc. Indian J. Comp. Anim. Physiol.4(2): 79-84.
Zinc	Rohu	Fish	Fresh	Mortality	NR-LETH	Whole Organism	T	12000		NC	ug/L	LAB	2006. Shukla, V., M. Dhankhar, and K.V. Sastry. Heavy Metal Toxicity on Labeo rohita. J. Ecotoxicol. Environ. Monit.16(3): 247-250.
Zinc chloride (ZnCl2)	Rohu	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2000		NC	ug/L	LAB	2004. Bhatkar, N.V.. Effects of Chlorides of Chromium, Nickel and Zinc on Melanophores of the Scales of Freshwater Carp Labeo rohita. J. Ecotoxicol. Environ. Monit.14(4): 267-272.
Sulfuric acid, Zinc salt (1:1)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	8985*	NA	NR	ug/L	LAB	1980. Pant, S.C., S. Kumar, and S.S. Khanna. Toxicity of Copper Sulphate and Zinc Sulphate to Fresh Water Teleost Puntius conchonius (Ham.) in Hard Water. Comp. Physiol. Ecol.5(3): 146-149.
Sulfuric acid, Zinc salt (1:1)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	8241*	NA	NR	ug/L	LAB	1980. Pant, S.C., S. Kumar, and S.S. Khanna. Toxicity of Copper Sulphate and Zinc Sulphate to Fresh Water Teleost Puntius conchonius (Ham.) in Hard Water. Comp. Physiol. Ecol.5(3): 146-149.
Sulfuric acid, Zinc salt (1:1)	Rosy Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	7561*	NA	NR	ug/L	LAB	1980. Pant, S.C., S. Kumar, and S.S. Khanna. Toxicity of Copper Sulphate and Zinc Sulphate to Fresh Water Teleost Puntius conchonius (Ham.) in Hard Water. Comp. Physiol. Ecol.5(3): 146-149.
Zinc	Rudd	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1967. Water Pollution Research Laboratory. Effects of Pollution on Fish. In: Water Pollution Research 1966, Ministry of Technology, London, England: 50-61.
Sulfuric acid, Zinc salt (1:1)	Rudd	Fish	Fresh	Mortality	NR	Not Reported	T	1600		NC	ug/L	LAB	1981. Van Hoof, F., and M. Van San. Analysis of Copper, Zinc, Cadmium and Chromium in Fish Tissues. A Tool for Detecting Metal Caused Fish Kills. Chemosphere10(10): 1127-1135.
Sulfuric acid, Zinc salt (1:1)	Rudd	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	7500		NC	ug/L	LAB	1981. Van Hoof, F., and M. Van San. Analysis of Copper, Zinc, Cadmium and Chromium in Fish Tissues. A Tool for Detecting Metal Caused Fish Kills. Chemosphere10(10): 1127-1135.
Zinc nitrate	Silver Carp	Fish	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.
Zinc nitrate	Silver Carp	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1988. Chen, Q., K. Zhang, and G. Xu. A Comprehensive Investigation of the Toxic Effects of Heavy Metals on Fish. J. Fish. China12(1): 21-33.
Sulfuric acid, Zinc salt (1:1)	Slender Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	56700	NA	NR	ug/L	LAB	1979. Khangarot, B.S., and V.K. Rajbanshi. Experimental Studies on Toxicity of Zinc to a Freshwater Teleost, Rasbora daniconius (Hamilton). Hydrobiologia65(2): 141-144.
Sulfuric acid, Zinc salt (1:1)	Slender Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	33300	NA	NR	ug/L	LAB	1979. Khangarot, B.S., and V.K. Rajbanshi. Experimental Studies on Toxicity of Zinc to a Freshwater Teleost, Rasbora daniconius (Hamilton). Hydrobiologia65(2): 141-144.
Sulfuric acid, Zinc salt (1:1)	Slender Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	42560	NA	NR	ug/L	LAB	1979. Khangarot, B.S., and V.K. Rajbanshi. Experimental Studies on Toxicity of Zinc to a Freshwater Teleost, Rasbora daniconius (Hamilton). Hydrobiologia65(2): 141-144.
Sulfuric acid, Zinc salt (1:1)	Slender Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	38100	NA	NR	ug/L	LAB	1979. Khangarot, B.S., and V.K. Rajbanshi. Experimental Studies on Toxicity of Zinc to a Freshwater Teleost, Rasbora daniconius (Hamilton). Hydrobiologia65(2): 141-144.
Sulfuric acid, Zinc salt (1:1)	Slender Rasbora	Fish	Fresh	Mortality	LC50	Not Reported	T	35200	NA	NR	ug/L	LAB	1979. Khangarot, B.S., and V.K. Rajbanshi. Experimental Studies on Toxicity of Zinc to a Freshwater Teleost, Rasbora daniconius (Hamilton). Hydrobiologia65(2): 141-144.
Sulfuric acid, Zinc salt (1:1)	Slender Rasbora	Fish	Fresh	Mortality	NR	Not Reported	T	49000	NA	NR	ug/L	LAB	1983. Khangarot, B.S.. Zinc Induced Lesions in the Gills of Rasbora Daniconius neilgeriensis (Hamilton). Acta Hydrochim. Hydrobiol.11(6): 675-677.
Sulfuric acid, Zinc salt (1:1)	Slender Rasbora	Fish	Fresh	Mortality	NR	Not Reported	T	49000	NA	NR	ug/L	LAB	1983. Khangarot, B.S.. Zinc Induced Lesions in the Gills of Rasbora Daniconius neilgeriensis (Hamilton). Acta Hydrochim. Hydrobiol.11(6): 675-677.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Growth	NR	Not Reported	T	12000	NA	NR	ug/L	LAB	1986. Shukla, J.P., and K. Pandey. Effect of a Sublethal Concentration of Zinc Sulphate on the Growth Rate of Fingerlings of Channa punctatus (Bloch), a Freshwater Murrel. Acta Hydrochim. Hydrobiol.14(6): 677-680.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Growth	NR	Not Reported	T	12000	NA	NR	ug/L	LAB	1986. Shukla, J.P., and K. Pandey. Effect of a Sublethal Concentration of Zinc Sulphate on the Growth Rate of Fingerlings of Channa punctatus (Bloch), a Freshwater Murrel. Acta Hydrochim. Hydrobiol.14(6): 677-680.
Zinc	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.008	NA	NR	%	LAB	1995. Sornaraj, R., P. Baskaran, and S. Thanalakshmi. Effects of Heavy Metals on Some Physiological Responses of Air-Breathing Fish Channa punctatus (Bloch). Environ. Ecol.13(1): 202-207.
Zinc	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	0.006	NA	NR	%	LAB	1995. Sornaraj, R., P. Baskaran, and S. Thanalakshmi. Effects of Heavy Metals on Some Physiological Responses of Air-Breathing Fish Channa punctatus (Bloch). Environ. Ecol.13(1): 202-207.
Zinc chloride (ZnCl2)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	80000	NA	NR	ug/L	LAB	1994. Dalal, R., and S. Bhattacharya. Effect of Cadmium, Mercury, and Zinc on the Hepatic Microsomal Enzymes of Channa punctatus. Bull. Environ. Contam. Toxicol.52(6): 893-897.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	50930	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	40930	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	21090	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	27840	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	25610	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Effect of Zinc, Copper and Mercury on Channa marulius (Hamilton). Acta Hydrochim. Hydrobiol.9(6): 639-649.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	24500		NC	ug/L	LAB	1998. Malik, D.S., K.V. Sastry, and D.P. Hamilton. Effects of Zinc Toxicity on Biochemical Composition of Muscle and Liver of Murrel (Channa punctatus). Environ. Int.24(4): 433-438.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	45.21	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Studies on the Acute Toxicity of Zinc to a Freshwater Teleost: Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.10(3): 285-292.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	45210	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	100000	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	38410	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	45210	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	45210	NA	NR	ug/L	LAB	1982. Khangarot, B.S., and V.S. Durve. Note on the Acute Toxicity of Zinc, and the Interactions of Zinc and Nickel to a Freshwater Teleost Channa punctatus (Bloch). Indian J. Anim. Sci.52(8): 722-725.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	50930	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	55000	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	35.78	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Studies on the Acute Toxicity of Zinc to a Freshwater Teleost: Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.10(3): 285-292.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	35780	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	29520	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	35780	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	35780	NA	NR	ug/L	LAB	1982. Khangarot, B.S., and V.S. Durve. Note on the Acute Toxicity of Zinc, and the Interactions of Zinc and Nickel to a Freshwater Teleost Channa punctatus (Bloch). Indian J. Anim. Sci.52(8): 722-725.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	40930	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	44740	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	49800*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	68740	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	30.68	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Studies on the Acute Toxicity of Zinc to a Freshwater Teleost: Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.10(3): 285-292.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	30680	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	26710	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	30680	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	30700	NA	NR	ug/L	LAB	1982. Khangarot, B.S., and V.S. Durve. Note on the Acute Toxicity of Zinc, and the Interactions of Zinc and Nickel to a Freshwater Teleost Channa punctatus (Bloch). Indian J. Anim. Sci.52(8): 722-725.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	33960	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	35060	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	35290	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	40100*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	29.88	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Studies on the Acute Toxicity of Zinc to a Freshwater Teleost: Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.10(3): 285-292.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	29880	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	22910	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	25520	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	27840	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	29880	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	29880	NA	NR	ug/L	LAB	1982. Khangarot, B.S., and V.S. Durve. Note on the Acute Toxicity of Zinc, and the Interactions of Zinc and Nickel to a Freshwater Teleost Channa punctatus (Bloch). Indian J. Anim. Sci.52(8): 722-725.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	30580	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	32200*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	29.88	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Studies on the Acute Toxicity of Zinc to a Freshwater Teleost: Channa punctatus (Bloch). Acta Hydrochim. Hydrobiol.10(3): 285-292.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	29880	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	20840	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	23970	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	24400*	NA	NR	ug/L	LAB	1983. Saxena, O.P., and A. Parashari. Comparative Study of the Toxicity of Six Heavy Metals to Channa punctatus. J. Environ. Biol.4(2): 91-94.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	24500	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	25610	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	29880	NA	NR	ug/L	LAB	1982. Khangarot, B.S.. Acute Toxicity of Zinc to Channa punctatus (Bloch), As a Result of Temperature, pH and Solubility Variations. Acta Hydrochim. Hydrobiol.10(4): 401-404.
Sulfuric acid, Zinc salt (1:1)	Snake-Head Catfish	Fish	Fresh	Mortality	LC50	Not Reported	T	29880	NA	NR	ug/L	LAB	1982. Khangarot, B.S., and V.S. Durve. Note on the Acute Toxicity of Zinc, and the Interactions of Zinc and Nickel to a Freshwater Teleost Channa punctatus (Bloch). Indian J. Anim. Sci.52(8): 722-725.
Zinc chloride (ZnCl2)	Sockeye Salmon	Fish	Fresh	Growth	NR		T	242	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Effects of Continuous Zinc Exposure on Sockeye Salmon During Adult-to-Smolt Freshwater Residency. Trans. Am. Fish. Soc.107(6): 828-836.
Zinc chloride (ZnCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	749	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Effects of Continuous Zinc Exposure on Sockeye Salmon During Adult-to-Smolt Freshwater Residency. Trans. Am. Fish. Soc.107(6): 828-836.
Zinc chloride (ZnCl2)	Sockeye Salmon	Fish	Fresh	Mortality	LC50	Not Reported	T	447	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Effects of Continuous Zinc Exposure on Sockeye Salmon During Adult-to-Smolt Freshwater Residency. Trans. Am. Fish. Soc.107(6): 828-836.
Zinc chloride (ZnCl2)	Sockeye Salmon	Fish	Fresh	Mortality	NR	Not Reported	T	242	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Effects of Continuous Zinc Exposure on Sockeye Salmon During Adult-to-Smolt Freshwater Residency. Trans. Am. Fish. Soc.107(6): 828-836.
Zinc chloride (ZnCl2)	Sockeye Salmon	Fish	Fresh	Reproduction	NR		T	242	NA	NR	ug/L	LAB	1978. Chapman, G.A.. Effects of Continuous Zinc Exposure on Sockeye Salmon During Adult-to-Smolt Freshwater Residency. Trans. Am. Fish. Soc.107(6): 828-836.
Sulfuric acid, Zinc salt (1:1)	Southern Platyfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	23000	NA	NR	ug/L	LAB	1968. Rachlin, J.W., and A. Perlmutter. Response of an Inbred Strain of Platyfish and the Fathead Minnow to Zinc. Prog. Fish-Cult.30(4): 203-207.
Sulfuric acid, Zinc salt (1:1)	Southern Platyfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	18000	NA	NR	ug/L	LAB	1968. Rachlin, J.W., and A. Perlmutter. Response of an Inbred Strain of Platyfish and the Fathead Minnow to Zinc. Prog. Fish-Cult.30(4): 203-207.
Sulfuric acid, Zinc salt (1:1)	Southern Platyfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	12000	NA	NR	ug/L	LAB	1968. Rachlin, J.W., and A. Perlmutter. Response of an Inbred Strain of Platyfish and the Fathead Minnow to Zinc. Prog. Fish-Cult.30(4): 203-207.
Zinc chloride (ZnCl2)	Spotted Barbel	Fish	Fresh	Mortality	LOEC	Not Reported	T	NR	NR	NR	uM	LAB	2008. Cho, Y.S., S.Y. Lee, K.Y. Kim, I.C. Bang, D.S. Kim, and Y.K. Nam. Gene Structure and Expression of Metallothionein During Metal Exposures in Hemibarbus mylodon. Ecotoxicol. Environ. Saf.71(1): 125-137.
Zinc chloride (ZnCl2)	Spotted Barbel	Fish	Fresh	Mortality	NOEC	Not Reported	T	NR	NR	NR	uM	LAB	2008. Cho, Y.S., S.Y. Lee, K.Y. Kim, I.C. Bang, D.S. Kim, and Y.K. Nam. Gene Structure and Expression of Metallothionein During Metal Exposures in Hemibarbus mylodon. Ecotoxicol. Environ. Saf.71(1): 125-137.
Sulfuric acid, Zinc salt (1:1)	Stone Loach	Fish	Fresh	Mortality	LC50	Not Reported	T	2500	NA	NR	ug/L	LAB	1975. Solbe, J.F.D., and V.A. Flook. Studies on the Toxicity of Zinc Sulphate and of Cadmium Sulphate to Stone Loach Noemacheilus barbatulus (L.) in Hard Water. J. Fish Biol.7(5): 631-637.
Zinc	Striped Bass	Fish	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Zinc	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	11300	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	1180	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	670	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Zinc	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	1340	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Zinc	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	6800	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	1770	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Zinc	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	1850	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Zinc	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	3090	NA	NR	ug/L	LAB	1971. O'Rear, C.W.,Jr.. Some Environmental Influences on the Zinc and Copper Content of Striped Bass, Morone saxatilis (Walbaum). Ph.D.Thesis, Va.Polytech.Inst.and State Univ., Blacksburg, VA: 71 p..
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	100		NC	ug/L	LAB	1969. Hughes, J.S.. Toxicity of Some Chemicals to Striped Bass (Roccus saxatilis). Proc. Southeast. Assoc. Game Fish Comm.22: 230-234.
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	100		NC	ug/L	LAB	1969. Hughes, J.S.. Toxicity of Some Chemicals to Striped Bass (Roccus saxatilis). Proc. Southeast. Assoc. Game Fish Comm.22: 230-234.
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	200	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	500	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	120	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	430	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	430	NA	NR	ug/L	LAB	1985. Palawski, D., J.B. Hunn, and F.J. Dwyer. Sensitivity of Young Striped Bass to Organic and Inorganic Contaminants in Fresh and Saline Waters. Trans. Am. Fish. Soc.114(5): 748-753.
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Zinc chloride (ZnCl2)	Striped Bass	Fish	Fresh	Mortality	LC50	Not Reported	T	100	NA	NR	ug/L	LAB	1973. Hughes, J.S.. Acute Toxicity of Thirty Chemicals to Striped Bass (Morone saxatilis). Presented at the Western Association of State Game and Fish Commissioners, Salt Lake Cite, Utah, La.Dep.Wildl.Fish.318-343-2417: 15 p..
Zinc nitrate	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	11200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	10000	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	Striped Bass	Fish	Fresh	Mortality	LC50*	Not Reported	T	6700	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Striped Catfish	Fish	Fresh	Mortality	LC50*	Not Reported	T	209000	NA	NR	ug/L	LAB	1982. Verma, S.R., M. Jain, and R.C. Dalela. A Laboratory Study to Assess Separate and In-Combination Effects of Zinc, Chromium and Nickel to the Fish Mystus vittatus. Acta Hydrochim. Hydrobiol.10(1): 23-29.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	18600	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	3300	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	35300	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	61200	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	70700	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	93200	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	13500	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	1900	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	24500	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	61200	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	70700	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	93200	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	13500	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	17900	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	61200	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	70700	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	93200	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	1100	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	12400	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	40600	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	61200	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	87800	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Zinc chloride (ZnCl2)	Ten-Spotted Livebearer	Fish	Fresh	Mortality	LC50	Not Reported	T	9100	NR	NR	ug/L	LAB	1998. Gomez, S., C. Villar, and C. Bonetto. Zinc Toxicity in the Fish Cnesterodon decemmaculatus in the Parana River and Rio de la Plata Estuary. Environ. Pollut.99(2): 159-165.
Sulfuric acid, Zinc salt (1:1)	Tetra	Fish	NR	Mortality	LC50	Not Reported	T	700	NA	NR	ug/L	LAB	1987. Cruz, M.C.. Bioconcentration of Zinc and Its Toxic Effects on Astyanax bimaculatus (Piscis, Characidae). Acta Cient. Venez.38(1): 94-98.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	NR	Mortality	LC50	Not Reported	T	6200		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	NR	Mortality	LC50	Not Reported	T	5180		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	NR	Mortality	LC50	Not Reported	T	4820		NC	ug/L	LAB	1999. Svecevicius, G.. Acute Toxicity of Zinc to Common Freshwater Fishes of Lithuania. Acta Zool. Litu.9(2): 114-118.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	100*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	80*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	60*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	40*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	30*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	20*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	10*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	10*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	10*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	8*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	4*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	3*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	2*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	1*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.8*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.4*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.3*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.2*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.2*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR	Not Reported	T	0.1*	NA	NR	ug/L	LAB	1938. Jones, J.R.E.. The Relative Toxicity of Salts of Lead, Zinc and Copper to the Stickleback (Gasterosteus aculeatus L.) and the Effect of Calcium on the Toxicity of Lead and Zinc Salts. J. Exp. Biol.15(3): 394-407.
Sulfuric acid, Zinc salt (1:1)	Threespine Stickleback	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	6500		NC	ug/L	LAB	1976. Brafield, A.E., and P. Matthiessen. Oxygen Consumption by Sticklebacks (Gasterosteus aculeatus L.) Exposed to Zinc. J. Fish Biol.9(4): 359-370.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	22000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	33000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	38000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	49000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	18000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	29000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	34000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	45000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	16000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	32000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	40000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	13000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	21000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	27000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.
Sulfuric acid, Zinc salt (1:1)	Tilapia	Fish	Fresh	Mortality	LC50	Not Reported	T	33000	NA	NR	ug/L	LAB	1987. Hilmy, A.M., N.A. El Domiaty, A.Y. Daabees, and H.A.A. Latife. Toxicity in Tilapia zilli and Clarias lazera (Pisces) Induced by Zinc, Seasonally. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.86(2): 263-265.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	500000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
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Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
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Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	LOEC	Not Reported	T	2000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
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Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
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Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
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Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	400000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	500000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	500000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Zinc chloride (ZnCl2)	Trout, Charr	Fish	NR	Reproduction	NOEC	Not Reported	T	1000000		NC	ug/L	LAB	2005. Ebrahimi, M.. Using Computer Assisted Sperm Analysis (CASA) to Monitoring the Effects of Zinc and Cadmium Pollution on Fish Sperm. Iran. J. Fish. Sci.4(2): 81-100.
Sulfuric acid, Zinc salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	85560	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	16220	NA	NR	ug/L	LAB	1979. Khangarot, B.S.. Experimental Investigations on the Acute Toxicity of Zinc to a Freshwater Teleost, Puntius sophore Hamilton. Rev. Biol.11(1-4): 119-127.
Sulfuric acid, Zinc salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	41270	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	13200	NA	NR	ug/L	LAB	1979. Khangarot, B.S.. Experimental Investigations on the Acute Toxicity of Zinc to a Freshwater Teleost, Puntius sophore Hamilton. Rev. Biol.11(1-4): 119-127.
Sulfuric acid, Zinc salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	37820	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	33010	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1979. Khangarot, B.S.. Experimental Investigations on the Acute Toxicity of Zinc to a Freshwater Teleost, Puntius sophore Hamilton. Rev. Biol.11(1-4): 119-127.
Sulfuric acid, Zinc salt (1:1)	Two Spot Barb, Dotted Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	31240	NA	NR	ug/L	LAB	1981. Khangarot, B.S.. Lethal Effects of Zinc and Nickel on Freshwater Teleosts. Acta Hydrochim. Hydrobiol.9(3): 297-302.
Sulfuric acid, Zinc salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	192.8*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.
Sulfuric acid, Zinc salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	181.0*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.
Sulfuric acid, Zinc salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	121.3*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Two-Spot Or Tic Tac Toe Barb	Fish	Fresh	Mortality	LC50	Not Reported	T	116.0*	NA	NR	ug/L	LAB	1985. Wagh, S.B., K. Shareef, and S. Shaikh. Acute Toxicity of Cadmium Sulphate, Zinc Sulphate and Copper Sulphate to Barbus ticto (Ham.): Effect on Oxygen Consumption and Gill Histology. J. Environ. Biol.6(4): 287-293.
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	3700		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	4000		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	4100		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	4200		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	4200		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	4300		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	4400		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	4400		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	4700		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	5400		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	6400		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	6600		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	7000		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	7300		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	2900	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	3300	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	LC50	Not Reported	T	4350	NA	NR	ug/L	LAB	1988. Mowbray, D.L.. Assessment of the Biological Impact of OK Tedi Mine Tailings, Cyanide and Heavy Metals. In: J.C.Pernetta (Ed.), Reg.Seas Rep.Stud.No.99, Potential Impacts of Mining on the Fly River, UNEP, Athens, Greece: 45-74.
Zinc	Western Mosquitofish	Fish	Fresh	Mortality	LC50*	Not Reported	T	116	NA	NR	ug/L	LAB	1978. Taylor, J.L.. Toxicity of Copper and Zinc in Two Arkansas Streams to Mosquitofish (Gambusia affinis). Bios49(3): 99-106.
Zinc chloride (ZnCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LOEC	Not Reported	T	18000		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Zinc chloride (ZnCl2)	Western Mosquitofish	Fish	Fresh	Mortality	LOEC	Not Reported	T	18000		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Zinc chloride (ZnCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NOEC	Not Reported	T	10800		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NOEC	Not Reported	T	10800		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Zinc chloride (ZnCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Zinc chloride (ZnCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Zinc chloride (ZnCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	30000		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Zinc chloride (ZnCl2)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	30000		NC	ug/L	LAB	1998. Klerks, P.L., and S.A. Lentz. Resistance to Lead and Zinc in the Western Mosquitofish Gambusia affinis Inhabiting Contaminated Bayou Trepagnier. Ecotoxicology7(1): 11-17.
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10030		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10030		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10100		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10200		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	10230		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	9730		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	9770		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	9820		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	9930		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	9930		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	9950		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..

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Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1030		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1600		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1750		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1760		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1820		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1820		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1840		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1850		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1870		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	1890		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3100		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3180		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3220		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	3260		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..

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Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	Western Mosquitofish	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR		NC	ug/L	LAB	1982. Roux, A.J.. Effects of Increased Environmental Realism on the Toxicity of Zinc and Selenium to Mosquitofish (Gambusia affinis) in Single Species Toxicity Tests. M.S.Thesis, North Carolina State Univ., Raleigh, NC: 56 p..
Sulfuric acid, Zinc salt (1:1)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	140000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid, Zinc salt (1:1)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	24000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid, Zinc salt (1:1)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	60000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid, Zinc salt (1:1)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	7400	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Sulfuric acid, Zinc salt (1:1)	White Cloud Mountain Minnow	Fish	NR	Mortality	LC50	Not Reported	T	76000	NA	NR	ug/L	LAB	1990. Kitamura, H.. Relation Between the Toxicity of Some Toxicants to the Aquatic Animals (Tanichthys albonubes and Neocaridina denticulata) and the Hardness of the Test Solution. Bull. Fac. Fish. Nagasaki Univ. (Chodai Sui Kempo)67: 13-19.
Zinc	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	13500	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	10100	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc	White Perch	Fish	Fresh	Mortality	LC50	Not Reported	T	14400	NA	NR	ug/L	LAB	1972. Rehwoldt, R., L.W. Menapace, B. Nerrie, and D. Allessandrello. The Effect of Increased Temperature upon the Acute Toxicity of Some Heavy Metal Ions. Bull. Environ. Contam. Toxicol.8(2): 91-96.
Zinc nitrate	White Perch	Fish	Fresh	Mortality	LC50*	Not Reported	T	13600	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	White Perch	Fish	Fresh	Mortality	LC50*	Not Reported	T	10200	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc nitrate	White Perch	Fish	Fresh	Mortality	LC50*	Not Reported	T	14300	NA	NR	ug/L	LAB	1971. Rehwoldt, R., G. Bida, and B. Nerrie. Acute Toxicity of Copper, Nickel, and Zinc Ions to Some Hudson River Fish Species. Bull. Environ. Contam. Toxicol.6(5): 445-448.
Zinc chloride (ZnCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	13300	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc chloride (ZnCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	5580	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Zinc chloride (ZnCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	2960	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Zinc chloride (ZnCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	2480	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Zinc chloride (ZnCl2)	White Sucker	Fish	Fresh	Mortality	LC50	Not Reported	T	2200	NA	NR	ug/L	LAB	1983. Duncan, D.A., and J.F. Klaverkamp. Tolerance and Resistance to Cadmium in White Suckers (Catostomus commersoni) Previously Exposed to Cadmium, Mercury, Zinc, or Selenium. Can. J. Fish. Aquat. Sci.40(2): 128-138.
Zinc	White Sucker	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	FIELDN	1995. Sloterdijk, H.H., A.M. Prud'homme, and J. Bureau. Hepatic Metallothionein Concentrations in White Sucker (Catostomus commersoni) from the St. Lawrence River: 1. Effects of Storage Conditions; 2. Correlation with Hepatic Heavy Metals. In: G.F.Westlake, J.L.Parrott and A.J.Niimi (Eds.), Proc.21st Annual Aquatic Toxicity Workshop, Oct.3-5, 1994, Sarnia, Ontario; Can.Tech.Rep.Fish.Aquat.Sci.No.2050: 117-126.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Growth	NOEC	Whole Organism	T	13000		NC	ug/L	LAB	2001. Nguyen, L.T.H., and C.R. Janssen. Comparative Sensitivity of Embryo-Larval Toxicity Assays with African Catfish (Clarias gariepinus) and Zebra Fish (Danio rerio). Environ. Toxicol.16(6): 566-571.
Zinc chloride (ZnCl2)	Zambezi Barbel	Fish	Fresh	Growth	NOEL	Whole Organism	T	9000		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Zinc chloride (ZnCl2)	Zambezi Barbel	Fish	Fresh	Growth	NOEL	Whole Organism	T	9000		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Growth	NOEL	Whole Organism	T	9000		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Growth	NOEL	Whole Organism	T	9000		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Zinc chloride (ZnCl2)	Zambezi Barbel	Fish	Fresh	Growth	NR	Whole Organism	T	NR		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Growth	NR	Whole Organism	T	NR		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Zinc chloride (ZnCl2)	Zambezi Barbel	Fish	Fresh	Mortality	EC50	Not Reported	T	3870		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	EC50	Not Reported	T	6010		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Zinc chloride (ZnCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	4040		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Zinc chloride (ZnCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	5610		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Zinc chloride (ZnCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	3610		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Zinc chloride (ZnCl2)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	4400		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	3860		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	4620		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	2210		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.

Table C-27. Summary of Results from the EcoTox Database for Fish - Zinc

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	3450		NC	ug/L	LAB	2003. Viljoen, A., G.J. Steyn, J.H.J. Van Vuren, and P.W. Wade. Zinc Effects on the Embryos and Larvae of the Sharptooth Catfish, Clarias gariepinus (Burchell, 1822). Bull. Environ. Contam. Toxicol.70(5): 1022-1027.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	LC50	Not Reported	T	18700		NC	ug/L	LAB	2001. Nguyen, L.T.H., and C.R. Janssen. Comparative Sensitivity of Embryo-Larval Toxicity Assays with African Catfish (Clarias gariepinus) and Zebra Fish (Danio rerio). Environ. Toxicol.16(6): 566-571.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	LOEC	Not Reported	T	13000		NC	ug/L	LAB	2001. Nguyen, L.T.H., and C.R. Janssen. Comparative Sensitivity of Embryo-Larval Toxicity Assays with African Catfish (Clarias gariepinus) and Zebra Fish (Danio rerio). Environ. Toxicol.16(6): 566-571.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	LOEC	Not Reported	T	2300		NC	ug/L	LAB	2001. Nguyen, L.T.H., and C.R. Janssen. Comparative Sensitivity of Embryo-Larval Toxicity Assays with African Catfish (Clarias gariepinus) and Zebra Fish (Danio rerio). Environ. Toxicol.16(6): 566-571.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	NOEC	Not Reported	T	13000		NC	ug/L	LAB	2001. Nguyen, L.T.H., and C.R. Janssen. Comparative Sensitivity of Embryo-Larval Toxicity Assays with African Catfish (Clarias gariepinus) and Zebra Fish (Danio rerio). Environ. Toxicol.16(6): 566-571.
Zinc	Zambezi Barbel	Fish	Fresh	Mortality	NR	Not Reported	T	900	NR	NR	ug/L	LAB	2006. Wegwu, M.O., and J.O. Akaninwor. Assessment of Heavy-Metal Profile of the New Calabar River and Its Impact on Juvenile Clarias gariepinus. Chem. Biodivers.3(1): 79-87.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	2500		NC	ug/L	LAB	2005. Oti, E.E., and D.A. Avoaja. Haematological Assessment of Freshwater Catfishes, Clarias gariepinus (Burch) and "Heteroclarias" (Hybrid) Exposed to Sublethal Concentrations of Zinc. Pak. J. Zool.37(2): 101-105.
Sulfuric acid, Zinc salt (1:1)	Zambezi Barbel	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	4000		NC	ug/L	LAB	1994. Annune, P.A., T.T. Iyaniwura, S. Ebele, and A.A. Oladimeji. Effects of Sublethal Concentrations of Zinc on Haematological Parameters of Freshwater Fishes, Clarias gariepinus (Burch) and Oreochromis niloticus (Trewavas). J. Aquaric. Aquat. Sci.9: 1-6.
Zinc chloride (ZnCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	LOEC	Sperm	T	75000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Zinc chloride (ZnCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	75000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Zinc chloride (ZnCl2)	Zambezi Barbel	Fish	Fresh	Reproduction	NOEC	Sperm	T	75000	NR	NR	ug/L	LAB	2004. Lahnsteiner, F., N. Mansour, and B. Berger. The Effect of Inorganic and Organic Pollutants on Sperm Motility of Some Freshwater Teleosts. J. Fish Biol.65(5): 1283-1297.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Growth	LOEC	Whole Organism	T	2800		NC	ug/L	LAB	2001. Nguyen, L.T.H., and C.R. Janssen. Comparative Sensitivity of Embryo-Larval Toxicity Assays with African Catfish (Clarias gariepinus) and Zebra Fish (Danio rerio). Environ. Toxicol.16(6): 566-571.
Zinc	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	6112	NR	NR	uM	LAB	2006. Chan, K.M., L.L. Ku, P.C.Y. Chan, and W.K. Cheuk. Metallothionein Gene Expression in Zebrafish Embryo-Larvae and ZFL Cell-Line Exposed to Heavy Metal Ions. Mar. Environ. Res.62(suppl.1): S83 - S87.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	31800	NA	NR	ug/L	LAB	1965. Cairns, J.,Jr., A. Scheier, and J.J. Loos. A Comparison of the Sensitivity to Certain Chemicals of Adult Zebra Danios, Brachydanio rerio (Hamilton-Buchanan) and Zebra Danio Eggs with that of Adult Bluegill Sunfish Lepomis macrochirus Raf.. Not. Nat. (Phila.)381: 1-9.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	105000	NA	NR	ug/L	LAB	1965. Cairns, J.,Jr., A. Scheier, and J.J. Loos. A Comparison of the Sensitivity to Certain Chemicals of Adult Zebra Danios, Brachydanio rerio (Hamilton-Buchanan) and Zebra Danio Eggs with that of Adult Bluegill Sunfish Lepomis macrochirus Raf.. Not. Nat. (Phila.)381: 1-9.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	28000	NA	NR	ug/L	LAB	1965. Cairns, J.,Jr., A. Scheier, and J.J. Loos. A Comparison of the Sensitivity to Certain Chemicals of Adult Zebra Danios, Brachydanio rerio (Hamilton-Buchanan) and Zebra Danio Eggs with that of Adult Bluegill Sunfish Lepomis macrochirus Raf.. Not. Nat. (Phila.)381: 1-9.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	25000	NA	NR	ug/L	LAB	1965. Cairns, J.,Jr., A. Scheier, and J.J. Loos. A Comparison of the Sensitivity to Certain Chemicals of Adult Zebra Danios, Brachydanio rerio (Hamilton-Buchanan) and Zebra Danio Eggs with that of Adult Bluegill Sunfish Lepomis macrochirus Raf.. Not. Nat. (Phila.)381: 1-9.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	10000	NA	NR	ug/L	LAB	1990. Van Leeuwen, C.J., E.M.M. Grootelaar, and G. Niebeek. Fish Embryos as Teratogenicity Screens: A Comparison of Embryotoxicity Between Fish and Birds. Ecotoxicol. Environ. Saf.20(1): 42-52.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	2100		NC	ug/L	LAB	2001. Nguyen, L.T.H., and C.R. Janssen. Comparative Sensitivity of Embryo-Larval Toxicity Assays with African Catfish (Clarias gariepinus) and Zebra Fish (Danio rerio). Environ. Toxicol.16(6): 566-571.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	2750		NC	ug/L	LAB	1976. Sarot, D.A., and A. Perlmutter. The Toxicity of Zinc to the Immune Response of the Zebrafish, Brachydanio rerio, Injected with Viral and Bacterial Antigens. Trans. Am. Fish. Soc.105(3): 456-459.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1985. Devillers, J., T. Meunier, and P. Chambon. Usefulness of the Dosage-Effect-Time Relation in Ecotoxicology for the Determination of Different Chemical Classes of Toxicants (Interet de la Relation Dose-Effet-Temps en Ecotoxicologie pour la Determination des Differe. Tech.Sci.Munic.80: 329-334.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50	Not Reported	T	190300	NA	NR	ug/L	LAB	1990. Vykusova, B., and Z. Svobodova. Acute Toxicity of Standards to Fish (Akutni Toxicita Standardu pro Ryby). Bull. V. U. R. H. Vodnany26(3): 15-20.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50*	Not Reported	T	6714000*	NA	NR	ug/L	LAB	1974. Roales, R.R., and A. Perlmutter. Toxicity of Zinc and Cygon, Applied Singly and Jointly, to Zebrafish Embryos. Bull. Environ. Contam. Toxicol.12(4): 475-480.

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50*	Not Reported	T	136000*	NA	NR	ug/L	LAB	1974. Roales, R.R., and A. Perlmutter. Toxicity of Zinc and Cygon, Applied Singly and Jointly, to Zebrafish Embryos. Bull. Environ. Contam. Toxicol.12(4): 475-480.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LC50*	Not Reported	T	19000*	NA	NR	ug/L	LAB	1974. Roales, R.R., and A. Perlmutter. Toxicity of Zinc and Cygon, Applied Singly and Jointly, to Zebrafish Embryos. Bull. Environ. Contam. Toxicol.12(4): 475-480.
Zinc	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	23100	NR	NR	ug/L	LAB	1998. Bowmer, C.T., R.N. Hooftman, A.O. Hanstveit, P.W.M. Venderbosch, and N. Van der Hoeven. The Ecotoxicity and the Biodegradability of Lactic Acid, Alkyl Lactate Esters and Lactate Salts. Chemosphere37(7): 1317-1333.
Zinc	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	2000	NR	NR	ug/L	LAB	1995. Meinelt, T., and A. Stueber. Subchronic Fish Toxicity of Copper and Zinc Dependent upon Water Hardness. Fortschr. Fisch. Wiss.12: 129-136.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	NR	NR	NR	mM	LAB	2006. Tilton, F., J.K. La Du, M. Vue, N. Alzarban, and R.L. Tanguay. Dithiocarbamates have a Common Toxic Effect on Zebrafish Body Axis Formation. Toxicol. Appl. Pharmacol.216(1): 55-68.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	3200	NA	NR	ug/L	LAB	1990. Van Leeuwen, C.J., E.M.M. Grootelaar, and G. Niebeek. Fish Embryos as Teratogenicity Screens: A Comparison of Embryotoxicity Between Fish and Birds. Ecotoxicol. Environ. Saf.20(1): 42-52.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	1400		NC	ug/L	LAB	2001. Nguyen, L.T.H., and C.R. Janssen. Comparative Sensitivity of Embryo-Larval Toxicity Assays with African Catfish (Clarias gariepinus) and Zebra Fish (Danio rerio). Environ. Toxicol.16(6): 566-571.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	12500	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	12500	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	1560	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	1560	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	25000	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	3130	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.

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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	3130	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	3130	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	3130	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	6250	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	100000	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	100000	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	LOEC	Not Reported	T	50000	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	1100	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	18000	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	4400	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	8800	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	18000	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	MATC	Not Reported	T	35000	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
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Zinc	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	1500	NR	NR	ug/L	LAB	1995. Meinelt, T., and A. Stueber. Subchronic Fish Toxicity of Copper and Zinc Dependent upon Water Hardness. Fortschr. Fisch. Wiss.12: 129-136.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	2800		NC	ug/L	LAB	2001. Nguyen, L.T.H., and C.R. Janssen. Comparative Sensitivity of Embryo-Larval Toxicity Assays with African Catfish (Clarias gariepinus) and Zebra Fish (Danio rerio). Environ. Toxicol.16(6): 566-571.
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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	12500	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.

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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	3130	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	6250	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	6250	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	780	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
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Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	50000	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NOEC	Not Reported	T	50000	NA	NR	ug/L	LAB	1987. Dave, G., B. Damgaard, M. Grande, J.E. Martelin, B. Rosander, and T. Viktor. Ring Test of an Embryo-Larval Toxicity Test with Zebrafish (Brachydanio rerio) Using Chromium and Zinc As Toxicants. Environ. Toxicol. Chem.6(1): 61-71.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Rougier, F., A. Menudier, C. Bosgiraud, and J.A. Nicolas. Copper and Zinc Exposure of Zebrafish, Brachydanio rerio (Hamilton-Buchaman): Effects in Experimental Listeria Infection. Ecotoxicol. Environ. Saf.34(2): 134-140.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Mortality	NR	Not Reported	T	19000*	NA	NR	ug/L	LAB	1974. Roales, R.R., and A. Perlmutter. Toxicity of Zinc and Cygon, Applied Singly and Jointly, to Zebrafish Embryos. Bull. Environ. Contam. Toxicol.12(4): 475-480.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	45000	NA	NR	ug/L	LAB	1965. Cairns, J.,Jr., A. Scheier, and J.J. Loos. A Comparison of the Sensitivity to Certain Chemicals of Adult Zebra Danios, Brachydanio rerio (Hamilton-Buchanan) and Zebra Danio Eggs with that of Adult Bluegill Sunfish Lepomis macrochirus Raf.. Not. Nat. (Phila.)381: 1-9.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	NR-LETH	Not Reported	T	155000	NA	NR	ug/L	LAB	1965. Cairns, J.,Jr., A. Scheier, and J.J. Loos. A Comparison of the Sensitivity to Certain Chemicals of Adult Zebra Danios, Brachydanio rerio (Hamilton-Buchanan) and Zebra Danio Eggs with that of Adult Bluegill Sunfish Lepomis macrochirus Raf.. Not. Nat. (Phila.)381: 1-9.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	87000	NA	NR	ug/L	LAB	1965. Cairns, J.,Jr., A. Scheier, and J.J. Loos. A Comparison of the Sensitivity to Certain Chemicals of Adult Zebra Danios, Brachydanio rerio (Hamilton-Buchanan) and Zebra Danio Eggs with that of Adult Bluegill Sunfish Lepomis macrochirus Raf.. Not. Nat. (Phila.)381: 1-9.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	65000	NA	NR	ug/L	LAB	1965. Cairns, J.,Jr., A. Scheier, and J.J. Loos. A Comparison of the Sensitivity to Certain Chemicals of Adult Zebra Danios, Brachydanio rerio (Hamilton-Buchanan) and Zebra Danio Eggs with that of Adult Bluegill Sunfish Lepomis macrochirus Raf.. Not. Nat. (Phila.)381: 1-9.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	8000	NA	NR	ug/L	LAB	1965. Cairns, J.,Jr., A. Scheier, and J.J. Loos. A Comparison of the Sensitivity to Certain Chemicals of Adult Zebra Danios, Brachydanio rerio (Hamilton-Buchanan) and Zebra Danio Eggs with that of Adult Bluegill Sunfish Lepomis macrochirus Raf.. Not. Nat. (Phila.)381: 1-9.
Zinc chloride (ZnCl2)	Zebra Danio	Fish	Fresh	Mortality	NR-ZERO	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Rougier, F., A. Menudier, C. Bosgiraud, and J.A. Nicolas. Copper and Zinc Exposure of Zebrafish, Brachydanio rerio (Hamilton-Buchaman): Effects in Experimental Listeria Infection. Ecotoxicol. Environ. Saf.34(2): 134-140.
Sulfuric acid, Zinc salt (1:1)	Zebra Danio	Fish	Fresh	Reproduction	NR		T	5000	NA	NR	ug/L	LAB	1977. Speranza, A.W., R.J. Seeley, V.A. Seeley, and A. Perlmutter. The Effect of Sublethal Concentrations of Zinc on Reproduction in the Zebrafish, Brachydanio rerio Hamilton-Buchanan. Environ. Pollut.12(3): 217-222.

ARCADIS

Table C-28. Acronyms for Summary of Results from the EcoTox Database for Fish

% g = percent grams
% v/v = percent volume per volume
* = denotes value is the dilution water chemistry (aquatic), denotes value is from the pretreatment media (soil)
A = analytical grade
AI = active ingredient
AM = analytical grade, measured
AN = analytical grade, nominal
Bq = becquerels
cc = cocoons
d = day
D = dissolved
ECXX = effective concentration to XX% of test organisms
EDXX = effective dose to XX% of test organisms
ERXX = effective residue concentration to XX% of test organisms
F = formulation
fd = food
FIELDA = undefined
FIELDN = undefined
FIELDU = undefined
g = gram
h = hour
I = inorganic monomeric
ICXX = inhibition concentration to XX% of test organisms
kg = kilograms
L = liter
LAB = laboratory
lb = pounds
LCXX = lethal concentration to XX% of test organisms
LDXX = lethal dose to XX% of test organisms
LETC = lethal threshold concentration
LOEC = lowest observable effect concentration
LOEL = lowest observable effect level
LRXX = lethal residue concentration to XX% of test organisms
M = molar
m2 = square meter
MATC = maximum acceptable toxicant concentration
mg = milligram
ml = milliliter
mM = millimolar
mmol = millimole
mol/L = moles per liter
molal = molality
N = normal
NA = not applicable
NC = not coded
NE = no effect
ng = nanogram
nM = nanomolar
nmol = nanomoles
NOEC = no observable effect concentration
NOEL = no observable effect level
NOER = no observable effect residue
NR = not reported
NR-LETH = 100% mortality or 0% survival of test organisms
NR-ZERO = 0% mortality or 100% survival of test organisms
org = organism
Pop growth = population growth
SE = significant effect
T = total
uCI = microcuries
ug = micrograms
uM = micromolar
umol = micromoles

Table C-29. Effects Based Tissue Concentrations for Fish - Aluminum

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	7.8	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	13.2	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	13.4	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	22.4	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	30	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	30	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	32.6	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	34.4	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	39.8	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	40.8	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	50.2	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	65.2	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Larval	Mortality	77.2	LD50	Water	Whole Body	1989. Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun. Water Air Soil Pol 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Immature	Survival	20	ED100	Combined	Whole Body	1989. Peterson, R.H., R.A. Bourbonniere, G.L.Lacroix, D.J.Martin-Robichaud, P.Takats and G. Brun. Water, Air and Soil Pollution 46:399-413
Salmon - Atlantic	Fish	Salt and Fresh	Immature	Survival	8	LOED	Combined	Whole Body	1989. Peterson, R.H., R.A. Bourbonniere, G.L.Lacroix, D.J.Martin-Robichaud, P.Takats and G. Brun. Water, Air and Soil Pollution 46:399-413
Trout - Brook	Fish	Fresh	Juvenile	Growth	12.5	NOED	Absorption	Whole Body	1991. Cleveland, L., D.R. Buckler, and W.G. Brumbaugh. Environ Tox & Chem 10:243-248
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.15	NOED	Ingestion	Muscle	1993. Handy, R.D. Journal of Fish Biology 42, 603-606
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	4.36	NOED	Ingestion	Liver	1993. Handy, R.D. Journal of Fish Biology 42, 603-606
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	5.07	NOED	Ingestion	Kidney	1993. Handy, R.D. Journal of Fish Biology 42, 603-606
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	6.1	NOED	Ingestion	Gill	1993. Handy, R.D. Journal of Fish Biology 42, 603-606
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	8.53	NOED	Ingestion	Whole Body	1993. Handy, R.D. Journal of Fish Biology 42, 603-606

Table C-30. Effects Based Tissue Concentrations for Fish - Arsenic

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Bluegill	Fish	Fresh	Juvenile	Growth	2.24	LOED	Combined	Whole Body	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Growth	5	LOED	Combined	Fillet	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Growth	11.6	LOED	Combined	Whole Body	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Juvenile	Growth	1.8	NOED	Combined	Whole Body	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Growth	3.16	NOED	Combined	Fillet	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Growth	5.5	NOED	Combined	Whole Body	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Growth	5.9	NOED	Combined	Kidney	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Growth	8.4	NOED	Combined	Ovary	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Growth	11.6	NOED	Combined	Liver	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Growth	17.6	NOED	Combined	Digestive Tract	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Growth	17.6	NOED	Combined	Gill	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Juvenile	Mortality	2.24	LOED	Combined	Whole Body	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Mortality	5	LOED	Combined	Fillet	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Mortality	11.6	LOED	Combined	Whole Body	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Juvenile	Mortality	1.8	NOED	Combined	Whole Body	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Mortality	3.16	NOED	Combined	Fillet	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Mortality	5.5	NOED	Combined	Whole Body	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Mortality	5.9	NOED	Combined	Kidney	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Mortality	8.4	NOED	Combined	Ovary	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Mortality	11.6	NOED	Combined	Liver	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Mortality	17.6	NOED	Combined	Gill	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Mortality	17.6	NOED	Combined	Digestive Tract	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Immature	Mortality	0.52	NOED	Absorption	Whole Body	1980. Barrows, M.E., S.R. Petrocelli, K.J. Macek and J.J. Carroll. p. 379-392 in Haque, R., ed. Dynamics, Exposure and Hazard Assessment of Toxic Chemicals
Bluegill	Fish	Fresh	Adult	Reproduction	0.76	LOED	Combined	Fillet	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Reproduction	1.72	LOED	Combined	Whole Body	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Reproduction	0.49	NOED	Combined	Fillet	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Bluegill	Fish	Fresh	Adult	Reproduction	0.53	NOED	Combined	Whole Body	1966. Gilderhus, P.A.. Trans Am Fish Soc 095:289-296
Green sunfish	Fish	Fresh	NA	Growth	116.3	NOED	Water	Whole Body	1976. Sorensen EMB. Bull Environ Contam Toxicol 15:756-761
Green sunfish	Fish	Fresh	NA	Mortality	1	LD50	Water	Muscle	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	3	LD50	Water	Muscle	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	5	LD50	Water	Muscle	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	5.2	LD50	Water	Muscle	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	6	LD50	Water	Muscle	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	19	LD50	Water	Gut	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	21.2	LD50	Water	Gut	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	22.6	LD50	Water	Gut	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	25	LD50	Water	Gut	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	27.4	LD50	Water	Liver	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	44.4	LD50	Water	Gut	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	77.2	LD50	Water	Liver	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	77.8	LD50	Water	Liver	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	82	LD50	Water	Liver	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	122.8	LD50	Water	Liver	1976. Sorensen EMB. Arch Environ Contam Toxicol 04:8-17
Green sunfish	Fish	Fresh	NA	Mortality	0.002	LT50	Water	Whole Body	1976. Sorensen EMB. Bull Environ Contam Toxicol 15:756-761
Green sunfish	Fish	Fresh	NA	Mortality	0.008	LT50	Water	Whole Body	1976. Sorensen EMB. Bull Environ Contam Toxicol 15:756-761
Green sunfish	Fish	Fresh	NA	Mortality	108.2	NOED	Water	Whole Body	1976. Sorensen EMB. Bull Environ Contam Toxicol 15:756-761
Green sunfish	Fish	Fresh	NA	Mortality	116.3	NOED	Water	Whole Body	1976. Sorensen EMB. Bull Environ Contam Toxicol 15:756-761
Killfish	Fish	Fresh	NS	Mortality	7.49	LD20	Water	Gill	2007. Shaw JR, B Jackson, K Gaber, S Stanton, JW Hamilton, BA Stanton. Environmental Toxicology and Chemistry 26(12):2704-2709
Killfish	Fish	Fresh	NS	Mortality	17.98	LD20	Water	Liver	2007. Shaw JR, B Jackson, K Gaber, S Stanton, JW Hamilton, BA Stanton. Environmental Toxicology and Chemistry 26(12):2704-2709
Killfish	Fish	Fresh	NS	Mortality	13.49	LD20	Water	Kidney	2007. Shaw JR, B Jackson, K Gaber, S Stanton, JW Hamilton, BA Stanton. Environmental Toxicology and Chemistry 26(12):2704-2709
Killfish	Fish	Fresh	NS	Mortality	5.99	LD20	Water	Whole Body	2007. Shaw JR, B Jackson, K Gaber, S Stanton, JW Hamilton, BA Stanton. Environmental Toxicology and Chemistry 26(12):2704-2709
Killfish	Fish	Fresh	NS	Mortality	29.22	LD70	Water	Liver	2007. Shaw JR, B Jackson, K Gaber, S Stanton, JW Hamilton, BA Stanton. Environmental Toxicology and Chemistry 26(12):2704-2709
Killfish	Fish	Fresh	NS	Mortality	18.73	LD70	Water	Kidney	2007. Shaw JR, B Jackson, K Gaber, S Stanton, JW Hamilton, BA Stanton. Environmental Toxicology and Chemistry 26(12):2704-2709
Killfish	Fish	Fresh	NS	Mortality	11.24	LD70	Water	Whole Body	2007. Shaw JR, B Jackson, K Gaber, S Stanton, JW Hamilton, BA Stanton. Environmental Toxicology and Chemistry 26(12):2704-2709
Mozambique tilapia	Fish	Fresh	Immature	Growth	0.4	ED16	Water		2006. Tsai JW, CM Liao. Arch Environ Contam Toxicol 50:144-152
Mozambique tilapia	Fish	Fresh	Adult	Mortality	3.1	LD10	Water	Muscle	2004. Liao CM, JW Tsai, MP Ling, YH Chou, PT Yang. Arch Environ Contam Toxicol 47:502-510
Mozambique tilapia	Fish	Fresh	Adult	Mortality	7.27	LD10	Water	Gill	2004. Liao CM, JW Tsai, MP Ling, YH Chou, PT Yang. Arch Environ Contam Toxicol 47:502-510

Table C-30. Effects Based Tissue Concentrations for Fish - Arsenic

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Mozambique tilapia	Fish	Fresh	Adult	Mortality	9.55	LD10	Water	Liver	2004. Liao CM, JW Tsai, MP Ling, YH Chou, PT Yang. Arch Environ Contam Toxicol 47:502-510
Mozambique tilapia	Fish	Fresh	Adult	Mortality	19.7	LD10	Water	Intestine	2004. Liao CM, JW Tsai, MP Ling, YH Chou, PT Yang. Arch Environ Contam Toxicol 47:502-510
Mozambique tilapia	Fish	Fresh	Adult	Mortality	28.5	LD10	Water	Intestine	2004. Liao CM, JW Tsai, MP Ling, YH Chou, PT Yang. Arch Environ Contam Toxicol 47:502-510
Mozambique tilapia	Fish	Fresh	Adult	Mortality	5.32	LD50	Water	Muscle	2004. Liao CM, JW Tsai, MP Ling, YH Chou, PT Yang. Arch Environ Contam Toxicol 47:502-510
Mozambique tilapia	Fish	Fresh	Adult	Mortality	13.47	LD50	Water	Gill	2004. Liao CM, JW Tsai, MP Ling, YH Chou, PT Yang. Arch Environ Contam Toxicol 47:502-510
Mozambique tilapia	Fish	Fresh	Adult	Mortality	5.69	LD50	Water	Liver	2004. Liao CM, JW Tsai, MP Ling, YH Chou, PT Yang. Arch Environ Contam Toxicol 47:502-510
Mozambique tilapia	Fish	Fresh	Adult	Mortality	33.7	LD50	Water	Intestine	2004. Liao CM, JW Tsai, MP Ling, YH Chou, PT Yang. Arch Environ Contam Toxicol 47:502-510
Mozambique tilapia	Fish	Fresh	Adult	Mortality	48.9	LD50	Water	Intestine	2004. Liao CM, JW Tsai, MP Ling, YH Chou, PT Yang. Arch Environ Contam Toxicol 47:502-510
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.006	ED08	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.8	ED08	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.006	ED08	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.8	ED08	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	5.32	ED09	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.6	ED09	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	5.32	ED09	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.6	ED09	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.78	ED11	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.864	ED11	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.808	ED11	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.06	ED11	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.78	ED11	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.864	ED11	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.808	ED11	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.06	ED11	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	5.32	ED12	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.6	ED12	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	5.32	ED12	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.6	ED12	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	5.32	ED16	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.6	ED16	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.78	ED16	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.864	ED16	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	5.32	ED16	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.6	ED16	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.78	ED16	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.864	ED16	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.78	ED19	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.864	ED19	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.78	ED19	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.864	ED19	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.06	ED21	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.808	ED21	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.864	ED21	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.06	ED21	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.808	ED21	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	4.06	ED21	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.808	ED21	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.864	ED21	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.6	ED29	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	5.32	ED29	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.6	ED29	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.6	ED29	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	5.32	ED29	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.6	ED30	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.6	ED30	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Immature	Growth	3	NOED	Absorption	Whole Body	1981. Dixon, D.G. and J.B. Sprague. J. Fish Biol. 18: 579-589
Trout - Rainbow	Fish	Fresh		Growth	3	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	3.05	LD30	Water	Whole Body	1990. McGeachy SM, DG Dixon. Can J Fish Aquat Sci 47:2228-2234
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.4	LD50	Water	Whole Body	1981. Dixion DG, JB Sprague. J Fish Biol 18:579-589
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	2.6	LD50	Water	Whole Body	1981. Dixion DG, JB Sprague. J Fish Biol 18:579-589
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	3	LD50	Water	Whole Body	1981. Dixion DG, JB Sprague. J Fish Biol 18:579-589
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	4.7	LD50	Water	Whole Body	1981. Dixion DG, JB Sprague. J Fish Biol 18:579-589
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.5	LD7	Water	Whole Body	1990. McGeachy SM, DG Dixon. Can J Fish Aquat Sci 47:2228-2234
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.5	LOED	Water	Whole Body	1990. McGeachy SM, DG Dixon. Can J Fish Aquat Sci 47:2228-2234
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	3.05	LOED	Water	Whole Body	1990. McGeachy SM, DG Dixon. Can J Fish Aquat Sci 47:2228-2234

Table C-30. Effects Based Tissue Concentrations for Fish - Arsenic

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout - Rainbow	Fish	Fresh	Immature	Mortality	4.7	NA	Absorption	Whole Body	1981. Dixon, D.G. and J.B. Sprague. J. Fish Biol. 18: 579-589
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.5	NOED	Water	Whole Body	1990. McGeachy SM, DG Dixon. Can J Fish Aquat Sci 47:2228-2234
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.85	NOED	Water	Whole Body	1990. McGeachy SM, DG Dixon. Can J Fish Aquat Sci 47:2228-2234
Trout - Rainbow	Fish	Fresh	Immature	Mortality	3	NOED	Absorption	Whole Body	1981. Dixon, D.G. and J.B. Sprague. J. Fish Biol. 18: 579-589

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Table C-31. Effects Based Tissue Concentrations for Fish - Beryllium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Bluegill	Fish	Fresh	Immature	Mortality	5.13	NOED	Absorption	Whole Body	1980. Barrows, M.E., S.R. Petrocelli, K.J. Macek and J.J. Carroll. p. 379-392 in Haque, R., ed. Dynamics, Exposure and Hazard Assessment of Toxic Chemicals

Table C-32. Effects Based Tissue Concentrations for Fish - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
American flagfish	Fish	Fresh	Immature	Growth	20	LOED	Combined	Whole Body	1976. Spehar, R.L.. J Fish Res Bd Can 33
American flagfish	Fish	Fresh		Growth	20	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
American flagfish	Fish	Fresh	Immature	Growth	10	NOED	Combined	Whole Body	1976. Spehar, R.L.. J Fish Res Bd Can 33
American flagfish	Fish	Fresh	Immature	Growth	6	NOED	Combined	Whole Body	1978. Spehar, R.L., Leonard, E.N., Defoe, D.L.. Trans Am Fish Soc 107(2): 354-360
American flagfish	Fish	Fresh		Growth	10	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
American flagfish	Fish	Fresh	Immature	Mortality	0.4	LOED	Combined	Whole Body	1978. Spehar, R.L., Leonard, E.N., Defoe, D.L.. Trans Am Fish Soc 107(2): 354-360
American flagfish	Fish	Fresh	Immature	Mortality	0.4	LOED	Combined	Whole Body	1978. Spehar, R.L., Leonard, E.N., Defoe, D.L.. Trans Am Fish Soc 107(2): 354-360
American flagfish	Fish	Fresh	Immature	Mortality	35	NOED	Combined	Whole Body	1976. Spehar, R.L.. J Fish Res Bd Can 33
American flagfish	Fish	Fresh	Immature	Mortality	0.09	NOED	Combined	Whole Body	1978. Spehar, R.L., Leonard, E.N., Defoe, D.L.. Trans Am Fish Soc 107(2): 354-360
American flagfish	Fish	Fresh	Immature	Mortality	0.4	NOED	Combined	Whole Body	1978. Spehar, R.L., Leonard, E.N., Defoe, D.L.. Trans Am Fish Soc 107(2): 354-360
American flagfish	Fish	Fresh		Reproduction	35	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
American flagfish	Fish	Fresh		Reproduction	35	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
American flagfish	Fish	Fresh	Immature	Reproduction	6	NOED	Combined	Whole Body	1978. Spehar, R.L., Leonard, E.N., Defoe, D.L.. Trans Am Fish Soc 107(2): 354-360
American flagfish	Fish	Fresh		Reproduction	6	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Belica	Fish	Fresh	NA	Mortality	0.2	LD83	Ingestion	Whole Body	1983. Ferard JF, JM Jouany, R Truhaut, P Vasseur. Ecotoxicol Environ Saf 07:43-52
Bluegill	Fish	Fresh	Adult	Growth	2.95	ED89	Combined	Liver	2003. Yoo JL, DM Janz. Arch Environ Contam Toxicol 45:110-120
Bluegill	Fish	Fresh	Juvenile	Growth	0.52	NOED	Water	Whole Body	1994. Cope WG, JG Wiener, and GJ Atchison. Environ Sci Tech 13(4):553-562
Bluegill	Fish	Fresh	Juvenile	Growth	0.52	NOED	Water	Whole Body	1994. Cope WG, JG Wiener, and GJ Atchison. Environ Sci Tech 13(4):553-562
Bluegill	Fish	Fresh	1-yr old	Mortality	40	LD100	Water	Gill	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	125	LD100	Water	Kidney	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	173	LD100	Water	Intestine	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	275	LD100	Water	Liver	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	21	LD50	Water	Gill	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	37	LD50	Water	Gill	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	140	LD50	Water	Intestine	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	157	LD50	Water	Kidney	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	210	LD50	Water	Intestine	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	213	LD50	Water	Kidney	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	325	LD50	Water	Liver	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	343	LD50	Water	Liver	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	Immature	Mortality	30	LOED	Absorption	Gill	1967. Mount, D.D. and C.E. Stephan.. Journal of Wildlife Management, 31(1):168-172.
Bluegill	Fish	Fresh	1-yr old	Mortality	34	NOED	Water	Gill	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	73	NOED	Water	Intestine	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	188	NOED	Water	Kidney	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	1-yr old	Mortality	201	NOED	Water	Liver	1974. Eaton, J.G.. Trans Am Fish Soc 004:729-735
Bluegill	Fish	Fresh	Immature	Mortality	26	NOED	Absorption	Gill	1967. Mount, D.D. and C.E. Stephan.. Journal of Wildlife Management, 31(1):168-172.
Bluegill	Fish	Fresh	Juvenile	Mortality	0.52	NOED	Water	Whole Body	1994. Cope WG, JG Wiener, and GJ Atchison. Environ Sci Tech 13(4):553-562
Bluegill	Fish	Fresh	Juvenile	Survival	0.52	NOED	Water	Whole Body	1994. Cope WG, JG Wiener, and GJ Atchison. Environ Sci Tech 13(4):553-562
Bull Trout	Fish	Fresh	Fry	Growth	0.183	ED28	Water	Whole Body	2002. Hansen, J.A., P.G. Welsh, J. Lipton, M.J. Suedkamp. Aquat Toxicol 58:165-174
Bull Trout	Fish	Fresh	Fry	Growth	0.032	ED42	Water	Whole Body	2002. Hansen, J.A., P.G. Welsh, J. Lipton, M.J. Suedkamp. Aquat Toxicol 58:165-174
Bull Trout	Fish	Fresh	Fry	Growth	0.091	ED54	Water	Whole Body	2002. Hansen, J.A., P.G. Welsh, J. Lipton, M.J. Suedkamp. Aquat Toxicol 58:165-174
Bull Trout	Fish	Fresh	Fry	Growth	0.032	LOED	Water	Whole Body	2002. Hansen, J.A., P.G. Welsh, J. Lipton, M.J. Suedkamp. Aquat Toxicol 58:165-174
Bull Trout	Fish	Fresh	Fry	Growth	0.183	LOED	Water	Whole Body	2002. Hansen, J.A., P.G. Welsh, J. Lipton, M.J. Suedkamp. Aquat Toxicol 58:165-174
Bull Trout	Fish	Fresh	Fry	Mortality	0.183	LD36	Water	Whole Body	2002. Hansen, J.A., P.G. Welsh, J. Lipton, M.J. Suedkamp. Aquat Toxicol 58:165-174
Bull Trout	Fish	Fresh	Fry	Mortality	0.114	NOED	Water	Whole Body	2002. Hansen, J.A., P.G. Welsh, J. Lipton, M.J. Suedkamp. Aquat Toxicol 58:165-174
Catfish	Fish	Fresh	Immature	Mortality	30	LOED	Absorption	Gill	1967. Mount, D.D. and C.E. Stephan.. Journal of Wildlife Management, 31(1):168-172.
Catfish	Fish	Fresh	Immature	Mortality	3	NOED	Absorption	Gill	1967. Mount, D.D. and C.E. Stephan.. Journal of Wildlife Management, 31(1):168-172.
Common carp	Fish	Fresh	Juvenile	Mortality	62	ED17	Combined	Kidney	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Common carp	Fish	Fresh	Juvenile	Mortality	4	ED17	Combined	Gill	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Common carp	Fish	Fresh	Juvenile	Mortality	4	ED17	Combined	Intestine	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Common carp	Fish	Fresh	Juvenile	Mortality	14	ED17	Combined	Liver	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Common carp	Fish	Fresh	Juvenile	Mortality	31.8	NOED	Water	Gill	2001. De Smet, H and R. Blust. Ecotoxicol Environ Saf 48:255-262
Common carp	Fish	Fresh	Juvenile	Mortality	44.35	NOED	Water	Liver	2001. De Smet, H and R. Blust. Ecotoxicol Environ Saf 48:255-262
Common carp	Fish	Fresh	Juvenile	Mortality	76.7	NOED	Water	Kidney	2001. De Smet, H and R. Blust. Ecotoxicol Environ Saf 48:255-262
Common carp	Fish	Fresh	Juvenile	Mortality	0.021	NOED	Water	Plasma	2001. De Smet, H and R. Blust. Ecotoxicol Environ Saf 48:255-262
Common carp	Fish	Fresh	Juvenile	Mortality	31.8	NOED	Water	Gill	2001. De Smet, H and R. Blust. Ecotoxicol Environ Saf 48:255-262
Common carp	Fish	Fresh	Juvenile	Mortality	4.4	NOED	Combined	Kidney	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Common carp	Fish	Fresh	Juvenile	Mortality	27	NOED	Combined	Kidney	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Common carp	Fish	Fresh	Juvenile	Mortality	5.6	NOED	Combined	Gill	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Common carp	Fish	Fresh	Juvenile	Mortality	21	NOED	Combined	Gill	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Common carp	Fish	Fresh	Juvenile	Mortality	0.6	NOED	Combined	Intestine	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Common carp	Fish	Fresh	Juvenile	Mortality	2	NOED	Combined	Intestine	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Common carp	Fish	Fresh	Juvenile	Mortality	1	NOED	Combined	Liver	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Common carp	Fish	Fresh	Juvenile	Mortality	10	NOED	Combined	Liver	2006. Reynders H, K Van Campenhout, L Bervoets, WM De Coen, R Blust. Environ Tox & Chem 25:1558-1567
Dace	Fish	Fresh	Juvenile	Growth	0.17	NOED	Water	Whole Body	1972. Kumada H, S Kimura, M Yokote, Y Matida. Bull Fresh Fish Res 22:157-165

Table C-32. Effects Based Tissue Concentrations for Fish - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Goldfish	Fish	Fresh	Adult	Mortality	0.322	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	0.874	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	0.55	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	2.584	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	0.896	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	5.77	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	2.898	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	4.66	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	4.76	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	5.45	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	5.05	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	14.6	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	3.28	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	5.87	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	5.53	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	6.97	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	7.71	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	17.35	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Grass Carp	Fish	Fresh	NS	Mortality	202.3	ED05	Absorption	Cell	2003. Xiang LX, JZ Shao. Bull Environ Contam Toxicol 71:114-122
Grass Carp	Fish	Fresh	NS	Mortality	202.3	ED15	Absorption	Cell	2003. Xiang LX, JZ Shao. Bull Environ Contam Toxicol 71:114-122
Grass Carp	Fish	Fresh	NS	Mortality	202.3	ED46	Absorption	Cell	2003. Xiang LX, JZ Shao. Bull Environ Contam Toxicol 71:114-122
Grass Carp	Fish	Fresh	NS	Mortality	202.3	ED62	Absorption	Cell	2003. Xiang LX, JZ Shao. Bull Environ Contam Toxicol 71:114-122
Grass Carp	Fish	Fresh	NS	Mortality	202.3	ED74	Absorption	Cell	2003. Xiang LX, JZ Shao. Bull Environ Contam Toxicol 71:114-122
Grass Carp	Fish	Fresh	NS	Mortality	202.3	ED82	Absorption	Cell	2003. Xiang LX, JZ Shao. Bull Environ Contam Toxicol 71:114-122
Green snakehead	Fish	Fresh	Larval	Mortality	1224.2	LD45	Water	Gill	1988. Gupta AK and VK Rajbanshi. Acta Hydrochim. Hydrobiol. 16(5):525-535
Green snakehead	Fish	Fresh	Larval	Mortality	1691.8	LD82	Water	Gill	1988. Gupta AK and VK Rajbanshi. Acta Hydrochim. Hydrobiol. 16(5):525-535
Green snakehead	Fish	Fresh	Larval	Mortality	955	NOED	Water	Gill	1988. Gupta AK and VK Rajbanshi. Acta Hydrochim. Hydrobiol. 16(5):525-535
Guppy	Fish	Fresh	Juvenile	Growth	1	LOED	Water	Whole Body	1982. Hatakeyama S, M Yasuno. Bull Environ Contam Toxicol 29:159-166
Guppy	Fish	Fresh	Immature	Growth	1	LOED	Ingestion	Whole Body	1982. Hatakeyama, S. and M. Yasuno. Bull Environ Contam Toxicol 29:159-166
Guppy	Fish	Fresh	Immature	Growth	0.5	NOED	Ingestion	Whole Body	1982. Hatakeyama, S. and M. Yasuno. Bull Environ Contam Toxicol 29:159-166
Guppy	Fish	Fresh	Immature	Growth	5	NOED	Absorption	Whole Body	1982. Hatakeyama, S. and M. Yasuno. Bull Environ Contam Toxicol 29:159-166
Guppy	Fish	Fresh		Growth	5	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Guppy	Fish	Fresh		Growth	1.2	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Guppy	Fish	Fresh	Immature	Mortality	8	LD50	Absorption	Whole Body	1982. Hatakeyama, S. and M. Yasuno. Bull Environ Contam Toxicol 29:159-166
Guppy	Fish	Fresh	Immature	Mortality	1.2	LOED	Ingestion	Whole Body	1982. Hatakeyama, S. and M. Yasuno. Bull Environ Contam Toxicol 29:159-166
Guppy	Fish	Fresh	Immature	Mortality	1	NOED	Ingestion	Whole Body	1982. Hatakeyama, S. and M. Yasuno. Bull Environ Contam Toxicol 29:159-166
Guppy	Fish	Fresh	Immature	Mortality	5	NOED	Absorption	Whole Body	1982. Hatakeyama, S. and M. Yasuno. Bull Environ Contam Toxicol 29:159-166
Largemouth Bass	Fish	Fresh	Juvenile	Mortality	0.044	LD25	Water	Gut	1974. Cearley JE, RL Coleman. Bull Environ Contam Toxicol 11:146-151
Largemouth Bass	Fish	Fresh	Juvenile	Mortality	0.043	LD50	Water	Gut	1974. Cearley JE, RL Coleman. Bull Environ Contam Toxicol 11:146-151
Largemouth Bass	Fish	Fresh	Juvenile	Mortality	0.042	LD75	Water	Gut	1974. Cearley JE, RL Coleman. Bull Environ Contam Toxicol 11:146-151
Mozambique tilapia	Fish	Fresh	Adult	Growth	0.01	NOED	Absorption	Brain	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Growth	0.03	NOED	Absorption	Muscle	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Growth	0.8	NOED	Absorption	Liver	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Growth	1	NOED	Absorption	Kidney	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Growth	1.2	NOED	Absorption	Gill	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Growth	2.6	NOED	Absorption	Gill	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Growth	3.1	NOED	Absorption	Liver	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Growth	4	NOED	Absorption	Intestine	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Mortality	0.01	NOED	Absorption	Brain	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Mortality	0.03	NOED	Absorption	Muscle	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Mortality	0.8	NOED	Absorption	Liver	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Mortality	1	NOED	Absorption	Kidney	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423

Table C-32. Effects Based Tissue Concentrations for Fish - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Mozambique tilapia	Fish	Fresh	Adult	Mortality	1.2	NOED	Absorption	Gill	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Mortality	2.6	NOED	Absorption	Gill	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Mortality	3.1	NOED	Absorption	Liver	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Mozambique tilapia	Fish	Fresh	Adult	Mortality	4	NOED	Absorption	Intestine	1995. Pelgrom, S.M.G.J., L.P.M. Lamers, R.A.C. Lock, P.H.M. Balm, and s.E. Wendelaar Bonga.. Environ Pollut 090(3):215-423
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	0.019	ED17	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	0.019	ED41	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	0.019	ED61	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Immature	Growth	0.26	LOED	Combined	Yolk Sac/Stomacl	1983. Peterson, R.H., J.L. Metcalfe, and S. Ray. Arch Environ Contam Toxicol 12:37-44
Salmon - Atlantic	Fish	Salt and Fresh		Growth	0.005	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Salmon - Atlantic	Fish	Salt and Fresh	Immature	Growth	0.05	NOED	Combined	Yolk Sac/Stomacl	1983. Peterson, R.H., J.L. Metcalfe, and S. Ray. Arch Environ Contam Toxicol 12:37-44
Salmon - Atlantic	Fish	Salt and Fresh	Immature	Mortality	0.26	LOED	Combined	Yolk Sac/Stomacl	1983. Peterson, R.H., J.L. Metcalfe, and S. Ray. Arch Environ Contam Toxicol 12:37-44
Salmon - Atlantic	Fish	Salt and Fresh	Immature	Mortality	0.05	NOED	Combined	Yolk Sac/Stomacl	1983. Peterson, R.H., J.L. Metcalfe, and S. Ray. Arch Environ Contam Toxicol 12:37-44
Seabass; Barramundi; Giant Perch	Fish	Fresh	Juvenile	Mortality	20.38	LD50	Water	Whole Body	1995. Shazili NAM. Bull Environ Contam Toxicol 54:22-28
Seabass; Barramundi; Giant Perch	Fish	Fresh	Juvenile	Mortality	30.48	LD50	Water	Whole Body	1995. Shazili NAM. Bull Environ Contam Toxicol 54:22-28
Seabass; Barramundi; Giant Perch	Fish	Fresh	Juvenile	Mortality	2.5	NOED	Water	Whole Body	1995. Shazili NAM. Bull Environ Contam Toxicol 54:22-28
Sharptooth Catfish	Fish	Fresh	Adult	Growth	0.12	ED19	Ingestion	Muscle	2006. Ruangsomboon S, L Wongrat. Aquat toxicol 78:15-20
Sharptooth Catfish	Fish	Fresh	Adult	Growth	0.24	ED22	Ingestion	Muscle	2006. Ruangsomboon S, L Wongrat. Aquat toxicol 78:15-20
Sheepshead minnow	Fish	Fresh	Egg-embryo	Growth	0.5	LOED	Absorption	Whole Body	1988. Meteyer, M.J., D.A. Wright and F.D. Martin. Environ Tox & Chem 07:321-328
Stone Loach	Fish	Fresh	NS	Mortality	2.3	NOED	Water	Whole Body	1989. Douben PET. Arch Environ Contam Toxicol 18:579-586
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.19	LD10	NA	Muscle	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.22	LD10	NA	Gonad	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.63	LD10	NA	Kidney	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.75	LD10	NA	Whole Body	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	1.05	LD10	NA	Other	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	1.09	LD10	NA	Skin	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	2.81	LD10	NA	Gill	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	3.96	LD10	NA	Gut	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	5.14	LD10	NA	Liver	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.62	LD27	Injection	Brain	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.68	LD27	Injection	Muscle	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	2.58	LD27	Injection	Skin	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	2.94	LD27	Injection	Whole Body	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	3.92	LD27	Injection	Gonad	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	5.18	LD27	Injection	Gill	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	14.06	LD27	Injection	Spleen	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	17.02	LD27	Injection	Gut	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	20.96	LD27	Injection	Kidney	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	23.3	LD27	Injection	Other	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530

Table C-32. Effects Based Tissue Concentrations for Fish - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Three-spined Stickleback	Fish	Fresh	NS	Mortality	39.44	LD27	Injection	Liver	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.16	LD6	NA	Muscle	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.24	LD6	NA	Brain	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.3	LD6	NA	Whole Body	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.5	LD6	NA	Gonad	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.66	LD6	NA	Skin	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.68	LD6	NA	Spleen	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.84	LD6	NA	Other	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.92	LD6	NA	Gill	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.96	LD6	NA	Kidney	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	1.79	LD6	NA	Gut	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	1.81	LD6	NA	Liver	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.12	LD90	NA	Brain	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	NS	Mortality	0.97	LD90	NA	Spleen	1983. Woodworth J, D Pascoe. Ecotoxicol Environ Saf 07:525-530
Three-spined Stickleback	Fish	Fresh	Adult	Mortality	0.9	LOED	Absorption	Whole Body	1977. Pascoe, D., and F.L. Mattey. J. Fish. Biol. 11, 207-215
Tilapia	Fish	Fresh	Juvenile	Mortality	5.2	LD100	Water	Head	2000. Zyadah, MA, E Abdel-Baky. Bull Environ Contam Toxicol 64:740-747
Tilapia	Fish	Fresh	Juvenile	Mortality	13.8	LD25	Water	Other	2000. Zyadah, MA, E Abdel-Baky. Bull Environ Contam Toxicol 64:740-747
Tilapia	Fish	Fresh	Juvenile	Mortality	10.6	LD40	Water	Other	2000. Zyadah, MA, E Abdel-Baky. Bull Environ Contam Toxicol 64:740-747
Tilapia	Fish	Fresh	Juvenile	Mortality	1.49	LD44	Water	Head	2000. Zyadah, MA, E Abdel-Baky. Bull Environ Contam Toxicol 64:740-747
Tilapia	Fish	Fresh	Juvenile	Mortality	4.82	LD44	Water	Other	2000. Zyadah, MA, E Abdel-Baky. Bull Environ Contam Toxicol 64:740-747
Tilapia	Fish	Fresh	Juvenile	Mortality	30.4	LD44	Water	Other	2000. Zyadah, MA, E Abdel-Baky. Bull Environ Contam Toxicol 64:740-747
Tilapia	Fish	Fresh	Juvenile	Mortality	5.3	LD44	Water	Head	2000. Zyadah, MA, E Abdel-Baky. Bull Environ Contam Toxicol 64:740-747
Trout - Brook	Fish	Fresh	Egg	Growth	0.25	LOED	Absorption	Whole Body	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Egg	Growth	1	LOED	Absorption	Gill	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Egg	Growth	1.8	LOED	Absorption	Liver	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Egg	Growth	13	LOED	Absorption	Kidney	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh		Growth	10	LOED		Liver	1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout - Brook	Fish	Fresh	Immature	Growth	0.232	NA	Combined	Liver	1987. Hamilton, S.J., Mehrle, P.M., and J.R. Jones. Trans Am Fish Soc 116(4): 541-550
Trout - Brook	Fish	Fresh	Juvenile	Growth	0.000323	NOED	Water	Liver	1987. Hamilton, SJ, PM Mehrle, and JR Jones. Trans Am Fish Soc 116(4):541-550
Trout - Brook	Fish	Fresh	Fry	Growth	751	NOED	Water	Whole Body	1987. Hamilton, SJ, PM Mehrle, and JR Jones. Trans Am Fish Soc 116:551-560
Trout - Brook	Fish	Fresh	Immature	Growth	1	NOED	Absorption	Gill	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Immature	Growth	1.6	NOED	Absorption	Liver	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Immature	Growth	10	NOED	Absorption	Kidney	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Juvenile	Mortality	0.000175	LD27	Water	Liver	1987. Hamilton, SJ, PM Mehrle, and JR Jones. Trans Am Fish Soc 116(4):541-550
Trout - Brook	Fish	Fresh	Juvenile	Mortality	0.000323	LD33	Water	Liver	1987. Hamilton, SJ, PM Mehrle, and JR Jones. Trans Am Fish Soc 116(4):541-550
Trout - Brook	Fish	Fresh	Juvenile	Mortality	0.000137	LD35	Water	Liver	1987. Hamilton, SJ, PM Mehrle, and JR Jones. Trans Am Fish Soc 116(4):541-550
Trout - Brook	Fish	Fresh	Fry	Mortality	751	LD42	Water	Whole Body	1987. Hamilton, SJ, PM Mehrle, and JR Jones. Trans Am Fish Soc 116:551-560
Trout - Brook	Fish	Fresh	Fry	Mortality	406	LD48	Water	Whole Body	1987. Hamilton, SJ, PM Mehrle, and JR Jones. Trans Am Fish Soc 116:551-560
Trout - Brook	Fish	Fresh	Fry	Mortality	752	LD53	Water	Whole Body	1987. Hamilton, SJ, PM Mehrle, and JR Jones. Trans Am Fish Soc 116:551-560
Trout - Brook	Fish	Fresh	Fry	Mortality	282	LD59	Water	Whole Body	1987. Hamilton, SJ, PM Mehrle, and JR Jones. Trans Am Fish Soc 116:551-560
Trout - Brook	Fish	Fresh	Fry	Mortality	144	LD80	Water	Whole Body	1987. Hamilton, SJ, PM Mehrle, and JR Jones. Trans Am Fish Soc 116:551-560
Trout - Brook	Fish	Fresh	Immature	Mortality	1	LOED	Absorption	Gill	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Egg	Mortality	1	LOED	Absorption	Gill	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Immature	Mortality	1.6	LOED	Absorption	Liver	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Egg	Mortality	1.8	LOED	Absorption	Liver	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Immature	Mortality	10	LOED	Absorption	Kidney	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Egg	Mortality	13	LOED	Absorption	Kidney	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Immature	Mortality	0.175	LOED	Combined	Liver	1987. Hamilton, S.J., Mehrle, P.M., and J.R. Jones. Trans Am Fish Soc 116(4): 541-550
Trout - Brook	Fish	Fresh	Immature	Mortality	144	LOED	Absorption	Whole Body	1987. Hamilton, S.J., Mehrle, P.M., and J.R. Jones. Trans Am Fish Soc 116: 551-560
Trout - Brook	Fish	Fresh	Egg	Mortality	0.026	NOED	Absorption	Whole Body	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560

Table C-32. Effects Based Tissue Concentrations for Fish - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout - Brook	Fish	Fresh	Egg	Mortality	0.042	NOED	Absorption	Whole Body	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Immature	Mortality	0.8	NOED	Absorption	Gill	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Immature	Mortality	1	NOED	Absorption	Liver	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Immature	Mortality	3.2	NOED	Absorption	Kidney	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Immature	Mortality	0.203	NOED	Combined	Liver	1987. Hamilton, S.J., Mehrle, P.M., and J.R. Jones. Trans Am Fish Soc 116(4): 541-550
Trout - Brook	Fish	Fresh	Immature	Reproduction	1	LOED	Absorption	Gill	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Immature	Reproduction	1.6	LOED	Absorption	Liver	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh	Immature	Reproduction	10	LOED	Absorption	Kidney	1976. Benoit, D.A., E.N. Leonard, G.M. Christensen, and J.T. Fiandt. Trans Am Fish Soc 004, pp. 550-560
Trout - Brook	Fish	Fresh		Reproduction	10	NOED		Liver	1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout - Brown	Fish	Fresh	Adult	Growth	63.2	LOED	Combined	Liver	1997. Clements, W.H., and D.E. Rees. Trans Am Fish Soc 126:774-785
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0254	ED92	Ingestion	Whole Body	2009. Ng T Y-T, JS Klink, CM Wood. Aquatic Toxicol 91:75-86
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.07	NOED	Water	Whole Body	1972. Kumada H, S Kimura, M Yokote, Y Matida. Bull Fresh Fish Res 22:157-165
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.44	NOED	Ingestion	Whole Body	1972. Kumada H, S Kimura, M Yokote, Y Matida. Bull Fresh Fish Res 22:157-165
Trout - Rainbow	Fish	Fresh	Adult	Growth	0.8	NOED	Absorption	Gill	1995. Zelikoff, J.T., D. Bowser, K.S. Squibb, and K. Frenkel.. Journal of Toxicology and Environmental Health 45:235-248.
Trout - Rainbow	Fish	Fresh	Adult	Growth	3	NOED	Absorption	Liver	1995. Zelikoff, J.T., D. Bowser, K.S. Squibb, and K. Frenkel.. Journal of Toxicology and Environmental Health 45:235-248.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	5.9	NOED	Water	Gill	2001. Hollis, L., C. Hogstrand, C.M. Wood. Arch Environ Contam Toxicol 41:468-474
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	3.8	NOED	Water	Liver	2001. Hollis, L., C. Hogstrand, C.M. Wood. Arch Environ Contam Toxicol 41:468-474
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	9.2	NOED	Water	Kidney	2001. Hollis, L., C. Hogstrand, C.M. Wood. Arch Environ Contam Toxicol 41:468-474
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.9	NOED	Water	Whole Body	2001. Hollis, L., C. Hogstrand, C.M. Wood. Arch Environ Contam Toxicol 41:468-474
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.50E-05	NOED	Water	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	9.20E-06	NOED	Water	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.005335	NOED	Ingestion	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.008136	NOED	Ingestion	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.007066	NOED	Ingestion	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.007541	NOED	Ingestion	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.035374	NOED	Ingestion	Pyloric Caeca	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.034911	NOED	Ingestion	Pyloric Caeca	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	2.60E-05	NOED	Water	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.50E-05	NOED	Water	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.004138	NOED	Ingestion	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.003856	NOED	Ingestion	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.005334	NOED	Ingestion	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.008031	NOED	Ingestion	Intestine	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.042752	NOED	Ingestion	Pyloric Caeca	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00065	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0008	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00016	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00175	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0002	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0001	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.00E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.50E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	2.20E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	3.50E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	7.00E-06	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	8.00E-06	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.20E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.00E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	3.00E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	3.80E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	6.50E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	8.00E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	7.00E-06	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	5.00E-06	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.33	NOED	Ingestion	Gill	2005. Baldisserotto B; MJ Chowdhury; CM Wood. Aquat Toxicol 72:99-117
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.06	NOED	Ingestion	Kidney	2005. Baldisserotto B; MJ Chowdhury; CM Wood. Aquat Toxicol 72:99-117
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.04	NOED	Ingestion	Liver	2005. Baldisserotto B; MJ Chowdhury; CM Wood. Aquat Toxicol 72:99-117
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0003	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0002	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	2.50E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	9.50E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00018	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00025	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	2.50E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	5.00E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964

Table C-32. Effects Based Tissue Concentrations for Fish - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	8.00E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	6.00E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	5.00E-05	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0002	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0005	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0011	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	5.00E-05	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	5.00E-05	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0003	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0002	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	4.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	6.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.00E-05	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.00E-05	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	2.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	2.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	4.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	3.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.80E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.50E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00045	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.001	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0007	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0007	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0001	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0001	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0002	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00025	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0018	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0028	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.003	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.004	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0005	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0008	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0009	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0018	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00075	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0035	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.004	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0075	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00075	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0015	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.003	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00675	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0004	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00028	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	7.50E-05	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0001	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00015	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	2.50E-05	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	5.00E-05	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	7.50E-05	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0045	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0035	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.004	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00325	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.002	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.001	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00125	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00175	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0005	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00045	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.000275	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.000325	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0003	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964

Table C-32. Effects Based Tissue Concentrations for Fish - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0001	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.00015	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0002	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Adult	Mortality	2.2	ED50	Combined	Whole Body	1986. Pascoe, D., S.A. Evans, and J. Woodworth. Arch Environ Contam Toxicol 15:481-487
Trout - Rainbow	Fish	Fresh	Adult	Mortality	3.74	ED50	Combined	Whole Body	1986. Pascoe, D., S.A. Evans, and J. Woodworth. Arch Environ Contam Toxicol 15:481-487
Trout - Rainbow	Fish	Fresh	Adult	Mortality	4	ED50	Combined	Whole Body	1986. Pascoe, D., S.A. Evans, and J. Woodworth. Arch Environ Contam Toxicol 15:481-487
Trout - Rainbow	Fish	Fresh	Adult	Mortality	6.4	ED50	Combined	Whole Body	1986. Pascoe, D., S.A. Evans, and J. Woodworth. Arch Environ Contam Toxicol 15:481-487
Trout - Rainbow	Fish	Fresh	Larval	Mortality	0.84	LD100	Absorption	Whole Body	1978. Beattie, J.H. and D. Pascoe. J. Fish. Biol. 13:631-637.
Trout - Rainbow	Fish	Fresh	Egg-embryo	Mortality	101	LD100	Absorption	Whole Body	1978. Beattie, J.H. and D. Pascoe. J. Fish. Biol. 13:631-637.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.62	LD50	Water	Gill	2004. Niyogi S, P Couture, G Pyle, DG McDonald, CM Wood. Can J Fish Aquat Sci 61:942-953
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.038	LD50	Water	Gill	2004. Niyogi S, P Couture, G Pyle, DG McDonald, CM Wood. Can J Fish Aquat Sci 61:942-953
Trout - Rainbow	Fish	Fresh	Egg-embryo	Mortality	0.21	LOED	Absorption	Whole Body	1978. Beattie, J.H. and D. Pascoe. J. Fish. Biol. 13:631-637.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	0.25	NOED	Absorption	Whole Body	1992. Handy, R.D.. Arch Environ Contam Toxicol 22:74-81
Trout - Rainbow	Fish	Fresh	Adult	Mortality	3	NOED	Absorption	Liver	1992. Handy, R.D.. Arch Environ Contam Toxicol 22:74-81
Trout - Rainbow	Fish	Fresh	Adult	Mortality	3.3	NOED	Absorption	Gill	1992. Handy, R.D.. Arch Environ Contam Toxicol 22:74-81
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	5.9	NOED	Water	Gill	2001. Hollis, L., C. Hogstrand, C.M. Wood. Arch Environ Contam Toxicol 41:468-474
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	3.8	NOED	Water	Liver	2001. Hollis, L., C. Hogstrand, C.M. Wood. Arch Environ Contam Toxicol 41:468-474
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	9.2	NOED	Water	Kidney	2001. Hollis, L., C. Hogstrand, C.M. Wood. Arch Environ Contam Toxicol 41:468-474
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.9	NOED	Water	Whole Body	2001. Hollis, L., C. Hogstrand, C.M. Wood. Arch Environ Contam Toxicol 41:468-474
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.33	NOED	Ingestion	Gill	2005. Baldisserotto B; MJ Chowdhury; CM Wood. Aquat Toxicol 72:99-117
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.06	NOED	Ingestion	Kidney	2005. Baldisserotto B; MJ Chowdhury; CM Wood. Aquat Toxicol 72:99-117
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.04	NOED	Ingestion	Liver	2005. Baldisserotto B; MJ Chowdhury; CM Wood. Aquat Toxicol 72:99-117
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00065	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0008	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00016	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00175	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0002	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0001	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0003	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0002	NOED	Water	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	2.50E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	9.50E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00018	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00025	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	2.50E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	5.00E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	8.00E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	6.00E-05	NOED	Water	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	5.00E-05	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0002	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0005	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0011	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	5.00E-05	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	5.00E-05	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0003	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0002	NOED	Water	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	4.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	6.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.00E-05	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.00E-05	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	2.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	2.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	4.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	3.00E-06	NOED	Water	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.00E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.50E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	2.20E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	3.50E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	7.00E-06	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	8.00E-06	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.20E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.00E-05	NOED	Water	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	3.00E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	3.80E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	6.50E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964

Table C-32. Effects Based Tissue Concentrations for Fish - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	8.00E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	7.00E-06	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	5.00E-06	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.80E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.50E-05	NOED	Water	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00045	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.001	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0007	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0007	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0001	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0001	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0002	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00025	NOED	Food	Gill	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0018	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0028	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.003	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.004	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0005	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0008	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0009	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0018	NOED	Food	Liver	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00075	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0035	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.004	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0075	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00075	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0015	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.003	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00675	NOED	Food	Kidney	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0004	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00028	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	7.50E-05	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0001	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00015	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	2.50E-05	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	5.00E-05	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	7.50E-05	NOED	Food	Carcass	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0045	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0035	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.004	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00325	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.002	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.001	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00125	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00175	NOED	Food	Stomach	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0005	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00045	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.000275	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.000325	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0003	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0001	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.00015	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0002	NOED	Food	Whole Body	2005. Franklin NM, CN Glover, JA Nicol, CM Wood. Environ Tox & Chem 24:2954-2964
Trout - Rainbow	Fish	Fresh	Adult	Reproduction	0.7	ED100	Water	Muscle	1994. Brown V, D Shurben, W Miller and M Crane. Ecotoxicol Environ Saf 29:38-46
Trout - Rainbow	Fish	Fresh	Adult	Reproduction	8.3	ED100	Water	Liver	1994. Brown V, D Shurben, W Miller and M Crane. Ecotoxicol Environ Saf 29:38-46
Trout - Rainbow	Fish	Fresh	Adult	Reproduction	66.3	ED100	Water	Kidney	1994. Brown V, D Shurben, W Miller and M Crane. Ecotoxicol Environ Saf 29:38-46
Trout - Rainbow	Fish	Fresh	Adult	Reproduction	0.16	ED100	Water	Muscle	1994. Brown V, D Shurben, W Miller and M Crane. Ecotoxicol Environ Saf 29:38-46
Trout - Rainbow	Fish	Fresh	Adult	Reproduction	0.62	ED100	Water	Muscle	1994. Brown V, D Shurben, W Miller and M Crane. Ecotoxicol Environ Saf 29:38-46
Trout - Rainbow	Fish	Fresh	Adult	Reproduction	5.8	ED100	Water	Liver	1994. Brown V, D Shurben, W Miller and M Crane. Ecotoxicol Environ Saf 29:38-46
Trout - Rainbow	Fish	Fresh	Adult	Reproduction	12.3	ED100	Water	Liver	1994. Brown V, D Shurben, W Miller and M Crane. Ecotoxicol Environ Saf 29:38-46
Trout - Rainbow	Fish	Fresh	Adult	Reproduction	52.6	ED100	Water	Kidney	1994. Brown V, D Shurben, W Miller and M Crane. Ecotoxicol Environ Saf 29:38-46
Trout - Rainbow	Fish	Fresh	Adult	Survival	11.1	NOED	Water	Liver	1994. Brown V, D Shurben, W Miller and M Crane. Ecotoxicol Environ Saf 29:38-46
Trout - Rainbow	Fish	Fresh	Adult	Survival	39.8	NOED	Water	Kidney	1994. Brown V, D Shurben, W Miller and M Crane. Ecotoxicol Environ Saf 29:38-46
Trout -Lake	Fish	Fresh	Adult	Growth	2.13	NOED	Absorption	Gill	1996. Kislalioglu, M., E. Scherer, and R.E. McNicol.. Env. Biol. Fish., 46:75-82.
Trout -Lake	Fish	Fresh	Adult	Growth	2.8	NOED	Absorption	Liver	1996. Kislalioglu, M., E. Scherer, and R.E. McNicol.. Env. Biol. Fish., 46:75-82.

Table C-32. Effects Based Tissue Concentrations for Fish - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout -Lake	Fish	Fresh	Adult	Growth	3.43	NOED	Absorption	Kidney	1996. Kislalioglu, M., E. Scherer, and R.E. McNicol.. Env. Biol. Fish., 46:75-82.
Yellow perch	Fish	Fresh	Immature	Growth	9.14	ED26	NS	Liver	2000. Laflamme J-S, Y Couillard, PGC Campbell and A Hontela. Can J Fish Aquat Sci 57:1692-1700
Yellow perch	Fish	Fresh	Immature	Growth	1.6	ED26	NS	Kidney	2000. Laflamme J-S, Y Couillard, PGC Campbell and A Hontela. Can J Fish Aquat Sci 57:1692-1700
Yellow perch	Fish	Fresh	Immature	Growth	9.14	ED4	NS	Liver	2000. Laflamme J-S, Y Couillard, PGC Campbell and A Hontela. Can J Fish Aquat Sci 57:1692-1700
Yellow perch	Fish	Fresh	Immature	Growth	1.6	ED4	NS	Kidney	2000. Laflamme J-S, Y Couillard, PGC Campbell and A Hontela. Can J Fish Aquat Sci 57:1692-1700
Yellow perch	Fish	Fresh	Juvenile	Mortality	3.56	LD50	Water	Gill	2004. Niyogi S, P Couture, G Pyle, DG McDonald, CM Wood. Can J Fish Aquat Sci 61:942-953
Yellow perch	Fish	Fresh	Juvenile	Mortality	2	LD50	Water	Gill	2004. Niyogi S, P Couture, G Pyle, DG McDonald, CM Wood. Can J Fish Aquat Sci 61:942-953

Table C-33. Effects Based Tissue Concentrations for Fish - Chlordane

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Sheepshead minnow	Fish	Fresh	Egg-embryo	Growth	11.7	NOED	Absorption	Whole Body	1977. Goodman, L.R., D.J. Hansen, J.A. Couch and J. Forester. Proc. 30th Annual Conf. SE Assn. Fish and Wildlife Agencies. p. 192-202
Sheepshead minnow	Fish	Fresh	Mature	Mortality	1.2	ED35	Combined	Whole Body	1976. Schimmel, S.C., Patrick, J.M., Forester, J.. Journal of Toxicology and Environmental Health, 1:955-965, 1976
Sheepshead minnow	Fish	Fresh	Mature	Mortality	909	ED35	Combined	Whole Body	1976. Schimmel, S.C., Patrick, J.M., Forester, J.. Journal of Toxicology and Environmental Health, 1:955-965, 1976
Sheepshead minnow	Fish	Fresh	Mature	Mortality	0.01	ED5	Combined	Whole Body	1976. Schimmel, S.C., Patrick, J.M., Forester, J.. Journal of Toxicology and Environmental Health, 1:955-965, 1976
Sheepshead minnow	Fish	Fresh	Mature	Mortality	0.019	ED5	Combined	Whole Body	1976. Schimmel, S.C., Patrick, J.M., Forester, J.. Journal of Toxicology and Environmental Health, 1:955-965, 1976
Sheepshead minnow	Fish	Fresh	Mature	Mortality	2	ED50	Combined	Whole Body	1976. Schimmel, S.C., Patrick, J.M., Forester, J.. Journal of Toxicology and Environmental Health, 1:955-965, 1976
Sheepshead minnow	Fish	Fresh	Mature	Mortality	17.5	ED50	Combined	Whole Body	1976. Schimmel, S.C., Patrick, J.M., Forester, J.. Journal of Toxicology and Environmental Health, 1:955-965, 1976
Sheepshead minnow	Fish	Fresh	Mature	Mortality	3.9	ED60	Combined	Whole Body	1976. Schimmel, S.C., Patrick, J.M., Forester, J.. Journal of Toxicology and Environmental Health, 1:955-965, 1976
Sheepshead minnow	Fish	Fresh	Mature	Mortality	32	ED60	Combined	Whole Body	1976. Schimmel, S.C., Patrick, J.M., Forester, J.. Journal of Toxicology and Environmental Health, 1:955-965, 1976
Sheepshead minnow	Fish	Fresh	Mature	Mortality	6.1	ED85	Combined	Whole Body	1976. Schimmel, S.C., Patrick, J.M., Forester, J.. Journal of Toxicology and Environmental Health, 1:955-965, 1976
Sheepshead minnow	Fish	Fresh	Mature	Mortality	47	ED85	Combined	Whole Body	1976. Schimmel, S.C., Patrick, J.M., Forester, J.. Journal of Toxicology and Environmental Health, 1:955-965, 1976
Sheepshead minnow	Fish	Fresh	Adult	Mortality	3.18	LOED	Combined	Whole Body	1976. Parrish, P.R., S.C. Schimmel, D.J. Hansen, J.M. Patrick, and J. Forester. Journal of Toxicology and Environmental Health, 1:485-494, 1976
Sheepshead minnow	Fish	Fresh	Adult	Mortality	281	LOED	Combined	Whole Body	1976. Parrish, P.R., S.C. Schimmel, D.J. Hansen, J.M. Patrick, and J. Forester. Journal of Toxicology and Environmental Health, 1:485-494, 1976
Sheepshead minnow	Fish	Fresh	Egg-embryo	Mortality	11.7	LOED	Absorption	Whole Body	1977. Goodman, L.R., D.J. Hansen, J.A. Couch and J. Forester. Proc. 30th Annual Conf. SE Assn. Fish and Wildlife Agencies. p. 192-202
Sheepshead minnow	Fish	Fresh	Adult	Mortality	0.6	NOED	Combined	Whole Body	1976. Parrish, P.R., S.C. Schimmel, D.J. Hansen, J.M. Patrick, and J. Forester. Journal of Toxicology and Environmental Health, 1:485-494, 1976
Sheepshead minnow	Fish	Fresh	Adult	Mortality	1.38	NOED	Combined	Whole Body	1976. Parrish, P.R., S.C. Schimmel, D.J. Hansen, J.M. Patrick, and J. Forester. Journal of Toxicology and Environmental Health, 1:485-494, 1976
Sheepshead minnow	Fish	Fresh	Adult	Mortality	87	NOED	Combined	Whole Body	1976. Parrish, P.R., S.C. Schimmel, D.J. Hansen, J.M. Patrick, and J. Forester. Journal of Toxicology and Environmental Health, 1:485-494, 1976
Sheepshead minnow	Fish	Fresh	Egg-embryo	Mortality	5.6	NOED	Absorption	Whole Body	1977. Goodman, L.R., D.J. Hansen, J.A. Couch and J. Forester. Proc. 30th Annual Conf. SE Assn. Fish and Wildlife Agencies. p. 192-202
Sheepshead minnow	Fish	Fresh	Adult	Reproduction	3.18	LOED	Combined	Whole Body	1976. Parrish, P.R., S.C. Schimmel, D.J. Hansen, J.M. Patrick, and J. Forester. Journal of Toxicology and Environmental Health, 1:485-494, 1976
Sheepshead minnow	Fish	Fresh	Adult	Reproduction	1.38	NOED	Combined	Whole Body	1976. Parrish, P.R., S.C. Schimmel, D.J. Hansen, J.M. Patrick, and J. Forester. Journal of Toxicology and Environmental Health, 1:485-494, 1976

Table C-34. Effects Based Tissue Concentrations for Fish - Chromium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Killfish	Fish	Fresh	Larval	Growth	44.12	ED15	Water	Whole Body	2006. Rolling JA, LJ Bain, Jgardea-Torresdey, J Bader, WS Baldwin. Environmental Toxicology and Chemistry 25:2725-2733
Killfish	Fish	Fresh	Larval	Growth	91.08	ED24	Water	Whole Body	2006. Rolling JA, LJ Bain, Jgardea-Torresdey, J Bader, WS Baldwin. Environmental Toxicology and Chemistry 25:2725-2733
Killfish	Fish	Fresh	Larval	Growth	30.38	ED46	Water	Whole Body	2006. Rolling JA, LJ Bain, Jgardea-Torresdey, J Bader, WS Baldwin. Environmental Toxicology and Chemistry 25:2725-2733
Killfish	Fish	Fresh	Larval	Growth	193.48	ED82	Water	Whole Body	2006. Rolling JA, LJ Bain, Jgardea-Torresdey, J Bader, WS Baldwin. Environmental Toxicology and Chemistry 25:2725-2733
Killfish	Fish	Fresh	Adult	Growth	0.263	NOED	Water	Whole Body	2006. Rolling JA, LJ Bain, Jgardea-Torresdey, J Bader, WS Baldwin. Environmental Toxicology and Chemistry 25:2725-2733
Killfish	Fish	Fresh	Adult	Growth	0.505	NOED	Water	Whole Body	2006. Rolling JA, LJ Bain, Jgardea-Torresdey, J Bader, WS Baldwin. Environmental Toxicology and Chemistry 25:2725-2733
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.28	ED30	Water	Whole Body	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	6.04	ED30	Water	Kidney	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.88	ED30	Water	Gill	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	0.42	ED30	Water	Liver	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.92	NOED	Water	Kidney	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.92	NOED	Water	Kidney	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.32	NOED	Water	Whole Body	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.32	NOED	Water	Whole Body	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	2.96	NOED	Water	Gill	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	2.96	NOED	Water	Gill	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	0.8	NOED	Water	Liver	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	0.8	NOED	Water	Liver	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.76	NOED	Water	Whole Body	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.76	NOED	Water	Whole Body	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.12	NOED	Water	Kidney	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.12	NOED	Water	Kidney	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.14	NOED	Water	Gill	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.14	NOED	Water	Gill	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	0.6	NOED	Water	Liver	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	0.6	NOED	Water	Liver	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	6.04	LD13	Water	Kidney	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	5.88	LD13	Water	Gill	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	0.42	LD13	Water	Liver	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	1.28	LD13	Water	Whole Body	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	1.3	LD28	Water	Whole Body	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	5.92	LD28	Water	Kidney	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	7.08	LD28	Water	Gill	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	0.74	LD28	Water	Liver	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	1.92	NOED	Water	Kidney	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	1.32	NOED	Water	Whole Body	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	2.96	NOED	Water	Gill	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	0.8	NOED	Water	Liver	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	1.76	NOED	Water	Whole Body	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	5.12	NOED	Water	Kidney	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	5.14	NOED	Water	Gill	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	0.6	NOED	Water	Liver	2006. Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland. Aquat Toxicol 76:246-257

Table C-35. Effects Based Tissue Concentrations for Fish - Copper

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Bluegill	Fish	Fresh	Juvenile	Growth	13	LOED	Water	Kidney	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Growth	44	LOED	Water	Gill	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Growth	480	LOED	Water	Liver	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Growth	6	NOED	Water	Kidney	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Growth	12	NOED	Water	Gill	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Growth	57	NOED	Water	Liver	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Reproduction	13	LOED	Water	Kidney	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Reproduction	44	LOED	Water	Gill	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Reproduction	480	LOED	Water	Liver	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Reproduction	6	NOED	Water	Kidney	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Reproduction	12	NOED	Water	Gill	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Reproduction	57	NOED	Water	Liver	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Survival	13	LOED	Water	Kidney	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Survival	44	LOED	Water	Gill	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Survival	480	LOED	Water	Liver	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Survival	6	NOED	Water	Kidney	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Survival	12	NOED	Water	Gill	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Bluegill	Fish	Fresh	Juvenile	Survival	57	NOED	Water	Liver	1975. Lee, J.H., J.R. Sylvester, and C.E. Nash.. Bull Environ Contam Toxicol 14(2):180-186
Common carp	Fish	Fresh	Fry	Growth	65.16	ED64	Water	Liver	1997. De Boeck G, A Vlaeminck, R Blust. Arch Environ Contam Toxicol 33:415-422
Common carp	Fish	Fresh	Fry	Growth	25.42	NOED	Water	Liver	1997. De Boeck G, A Vlaeminck, R Blust. Arch Environ Contam Toxicol 33:415-422
Common carp	Fish	Fresh	Fry	Growth	29.29	NOED	Water	Liver	1997. De Boeck G, A Vlaeminck, R Blust. Arch Environ Contam Toxicol 33:415-422
Common carp	Fish	Fresh	Fry	Growth	29.29	NOED	Water	Liver	1997. De Boeck G, A Vlaeminck, R Blust. Arch Environ Contam Toxicol 33:415-422
Common carp	Fish	Fresh	Fry	Growth	25.65	NOED	Water	Liver	1997. De Boeck G, A Vlaeminck, R Blust. Arch Environ Contam Toxicol 33:415-422
Trout - Brook	Fish	Fresh	1-yr old	Growth	1.34	NOED	Absorption	Gill	1974. McKim, J.M. and D.A. Benoit. J Fish Res Bd Can 31, No. 4, 449-452.
Trout - Brook	Fish	Fresh	1-yr old	Growth	3.3	NOED	Absorption	Kidney	1974. McKim, J.M. and D.A. Benoit. J Fish Res Bd Can 31, No. 4, 449-452.
Trout - Brook	Fish	Fresh	1-yr old	Growth	3.4	NOED	Absorption	Muscle	1974. McKim, J.M. and D.A. Benoit. J Fish Res Bd Can 31, No. 4, 449-452.
Trout - Brook	Fish	Fresh	1-yr old	Growth	47.8	NOED	Absorption	Liver	1974. McKim, J.M. and D.A. Benoit. J Fish Res Bd Can 31, No. 4, 449-452.
Trout - Brook	Fish	Fresh	1-yr old	Mortality	1.34	NOED	Absorption	Gill	1974. McKim, J.M. and D.A. Benoit. J Fish Res Bd Can 31, No. 4, 449-452.
Trout - Brook	Fish	Fresh	1-yr old	Mortality	3.3	NOED	Absorption	Kidney	1974. McKim, J.M. and D.A. Benoit. J Fish Res Bd Can 31, No. 4, 449-452.
Trout - Brook	Fish	Fresh	1-yr old	Mortality	3.4	NOED	Absorption	Muscle	1974. McKim, J.M. and D.A. Benoit. J Fish Res Bd Can 31, No. 4, 449-452.
Trout - Brook	Fish	Fresh	Egg-embryo	Mortality	5.6	NOED	Absorption	Eggs	1974. McKim, J.M. and D.A. Benoit. J Fish Res Bd Can 31, No. 4, 449-452.
Trout - Brook	Fish	Fresh	1-yr old	Mortality	47.8	NOED	Absorption	Liver	1974. McKim, J.M. and D.A. Benoit. J Fish Res Bd Can 31, No. 4, 449-452.
Trout - Brown	Fish	Fresh	Fingerling	Mortality	1.4	LD15	Combined	Kidney	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Brown	Fish	Fresh	Fingerling	Mortality	200	LD15	Combined	Liver	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Brown	Fish	Fresh	Fingerling	Mortality	2.2	LD15	Combined	Gill	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Brown	Fish	Fresh	Fry	Mortality	220	LD16	Combined	Liver	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Brown	Fish	Fresh	Fry	Mortality	1.6	LD16	Combined	Kidney	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Brown	Fish	Fresh	Fry	Mortality	0.8	LD16	Combined	Gill	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Brown	Fish	Fresh	Fingerling	Mortality	220	LD21	Combined	Liver	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Brown	Fish	Fresh	Fingerling	Mortality	0.8	LD21	Combined	Gill	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Brown	Fish	Fresh	Fingerling	Mortality	1.6	LD21	Combined	Kidney	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Brown	Fish	Fresh	Fingerling	Mortality	305	LD25	Combined	Liver	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Brown	Fish	Fresh	Fingerling	Mortality	3.4	LD25	Combined	Gill	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Brown	Fish	Fresh	Fingerling	Mortality	2.2	LD25	Combined	Kidney	1990. Phillips G, R Spoon. http://ibscore.dbs.umt.edu/clarkfork/Past_...ngs/1990_proceedings/phillips/Phillips.htm 10/04/2001, 2:52PM
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.96	ED15	Water	Whole Body	2002. Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp. Aquat Toxicol 58:175-188
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	288.2	ED15	Ingestion	Liver	1985. Lanno RP, SJ Slinger, JW Hilton. Aquaculture 49:257-268
Trout - Rainbow	Fish	Fresh	Fry	Growth	256.4	ED16	Ingestion	Liver	1985. Lanno RP, SJ Slinger, JW Hilton. Aquaculture 49:257-268
Trout - Rainbow	Fish	Fresh	Fry	Growth	2	ED19	Water	Whole Body	2002. Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp. Aquat Toxicol 58:175-188
Trout - Rainbow	Fish	Fresh	Fry	Growth	636.6	ED27	Ingestion	Liver	1985. Lanno RP, SJ Slinger, JW Hilton. Aquaculture 49:257-268
Trout - Rainbow	Fish	Fresh	Fry	Growth	2.6	ED33	Water	Whole Body	2002. Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp. Aquat Toxicol 58:175-188
Trout - Rainbow	Fish	Fresh	Fry	Growth	3.22	ED48	Water	Whole Body	2002. Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp. Aquat Toxicol 58:175-188
Trout - Rainbow	Fish	Fresh	Fry	Growth	177.2	ED56	Ingestion	Liver	1985. Lanno RP, SJ Slinger, JW Hilton. Aquaculture 49:257-268
Trout - Rainbow	Fish	Fresh	Fry	Growth	256.4	ED85	Ingestion	Liver	1985. Lanno RP, SJ Slinger, JW Hilton. Aquaculture 49:257-268

Table C-35. Effects Based Tissue Concentrations for Fish - Copper

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout - Rainbow	Fish	Fresh	Fry	Growth	636.6	ED93	Ingestion	Liver	1985. Lanno RP, SJ Slinger, JW Hilton. Aquaculture 49:257-268
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.96	LOED	Water	Whole Body	2002. Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp. Aquat Toxicol 58:175-188
Trout - Rainbow	Fish	Fresh	Fry	Growth	1.68	NOED	Water	Whole Body	2002. Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp. Aquat Toxicol 58:175-188
Trout - Rainbow	Fish	Fresh	Fry	Mortality	2.6	LD10	Water	Whole Body	2002. Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp. Aquat Toxicol 58:175-188
Trout - Rainbow	Fish	Fresh	Fry	Mortality	3.22	LD45	Water	Whole Body	2002. Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp. Aquat Toxicol 58:175-188
Trout - Rainbow	Fish	Fresh	Fry	Mortality	2.6	LOED	Water	Whole Body	2002. Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp. Aquat Toxicol 58:175-188
Trout - Rainbow	Fish	Fresh	Fry	Mortality	2	NOED	Water	Whole Body	2002. Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp. Aquat Toxicol 58:175-188
Trout - Rainbow	Fish	Fresh	Immature	Survival	4.48	LOED	Combined	Whole Body	1994. Mount, D.R., A.K. Barth, T.D.Garrison, K.A. Barten, and J.R. Hockett. Environ Tox & Chem 13(12):2031-2041
Trout - Rainbow	Fish	Fresh	Juvenile	Survival	288.2	NOED	Ingestion	Liver	1985. Lanno RP, SJ Slinger, JW Hilton. Aquaculture 49:257-268

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Table C-36. Effects Based Tissue Concentrations for Fish - Iron

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout - Brown	Fish	Fresh	Juvenile	Mortality	1050	LD50	Water	Gill	1999. Dalzell, D.J.B., N.A.A. MacFarlane. J. Fish Biology
Trout - Brown	Fish	Fresh	Juvenile	Mortality	320	LD50	Water	Gill	1999. Dalzell, D.J.B., N.A.A. MacFarlane. J. Fish Biology
Trout - Brown	Fish	Fresh	Larval	Mortality	9	LD85	Water	Whole Body	1997. Anderson, O.. Fish Physiol & Biochem 16:223-231
Trout - Brown	Fish	Fresh	Egg	Mortality	9	NOED	Water	Whole Body	1997. Anderson, O.. Fish Physiol & Biochem 16:223-231

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Table C-37. Effects Based Tissue Concentrations for Fish - Lead

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Bluegill	Fish	Fresh	Adult	Growth	0.393	ED89	Combined	Liver	2003. Yoo JL, DM Janz. Arch Environ Contam Toxicol 45:110-120
Fathead minnow	Fish	Fresh	Juvenile	Mortality	200	LD50	Water	Gill	2003. Rogers JT, JG Rfichards, CM Wood. Aquat Toxicol 64:215-234
Fathead minnow	Fish	Fresh	Juvenile	Mortality	35	LD50	Water	Kidney	2003. Rogers JT, JG Rfichards, CM Wood. Aquat Toxicol 64:215-234
Fathead minnow	Fish	Fresh	Juvenile	Mortality	16	LD50	Water	Liver	2003. Rogers JT, JG Rfichards, CM Wood. Aquat Toxicol 64:215-234
Goldfish	Fish	Fresh	Adult	Mortality	0.85	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	3.124	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	1.26	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	4.68	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	1.42	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	5.61	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	1.03	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	5.6	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	1.66	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	7.01	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	2.16	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	10.75	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	2.64	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	6.77	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	3.57	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	8.55	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	4.53	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	12.38	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Salmon-coho	Fish	Salt and Fresh	Juvenile	Mortality	3.16	LC27	Water	Whole Body	1993. Borgmann, U, WP Norwood, and C Clarke. Hydrobiologia 259:78-89.
Salmon-coho	Fish	Salt and Fresh	Juvenile	Mortality	3.84	LC53	Water	Whole Body	1993. Borgmann, U, WP Norwood, and C Clarke. Hydrobiologia 259:78-89.
Salmon-coho	Fish	Salt and Fresh	Juvenile	Mortality	6	LC82	Water	Whole Body	1993. Borgmann, U, WP Norwood, and C Clarke. Hydrobiologia 259:78-89.
Salmon-coho	Fish	Salt and Fresh	Juvenile	Mortality	4.18	LC94	Water	Whole Body	1993. Borgmann, U, WP Norwood, and C Clarke. Hydrobiologia 259:78-89.
Tilapia	Fish	Fresh	Adult	Growth	0.9	NOED	Water	Muscle	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Tilapia	Fish	Fresh	Adult	Growth	0.9	NOED	Water	Muscle	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Tilapia	Fish	Fresh	Adult	Growth	2.3	NOED	Water	Muscle	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Tilapia	Fish	Fresh	Adult	Growth	1.9	NOED	Water	Muscle	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Tilapia	Fish	Fresh	Adult	Growth	4.5	NOED	Water	Gill	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Tilapia	Fish	Fresh	Adult	Growth	12.7	NOED	Water	Gill	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Tilapia	Fish	Fresh	Adult	Growth	14	NOED	Water	Gill	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Tilapia	Fish	Fresh	Adult	Growth	20.3	NOED	Water	Gill	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Tilapia	Fish	Fresh	Adult	Growth	3.3	NOED	Water	Liver	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Tilapia	Fish	Fresh	Adult	Growth	4	NOED	Water	Liver	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Tilapia	Fish	Fresh	Adult	Growth	4	NOED	Water	Liver	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Tilapia	Fish	Fresh	Adult	Growth	2	NOED	Water	Liver	1999. Ay O; M Kalay; L Tamer; M Canli. Bull Environ Contam Toxicol 62:160-168
Trout - Brook	Fish	Fresh	Egg-embryo	Growth	4	LOED	Absorption	Whole Body	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh		Growth	60	LOED		Kidney	1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout - Brook	Fish	Fresh	Egg	Growth	4.02	NOED	Water	Whole Body	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Growth	16	NOED	Water	Liver	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Growth	54	NOED	Water	Red Blood Cells	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Growth	80	NOED	Water	Gill	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Growth	100	NOED	Water	Kidney	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Immature	Growth	0.6	NOED	Absorption	Muscle	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Egg-embryo	Growth	2.55	NOED	Absorption	Whole Body	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Growth	3.2	NOED	Absorption	Gonad	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Growth	4	NOED	Absorption	Red Blood Cells	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Growth	6	NOED	Absorption	Spleen	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Egg-embryo	Growth	10	NOED	Absorption	Liver	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Growth	20	NOED	Absorption	Liver	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Egg-embryo	Growth	35.8	NOED	Absorption	Kidney	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Egg-embryo	Growth	35.8	NOED	Absorption	Gill	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Growth	70	NOED	Absorption	Gill	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Growth	100	NOED	Absorption	Kidney	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh		Growth	40	NOED		Kidney	1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout - Brook	Fish	Fresh	Immature	Mortality	0.6	NOED	Absorption	Muscle	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Mortality	3.2	NOED	Absorption	Gonad	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Mortality	4	NOED	Absorption	Red Blood Cells	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Egg-embryo	Mortality	4.02	NOED	Absorption	Whole Body	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Mortality	6	NOED	Absorption	Spleen	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Egg-embryo	Mortality	10	NOED	Absorption	Liver	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Mortality	20	NOED	Absorption	Liver	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Egg-embryo	Mortality	20	NOED	Absorption	Gill	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.

Table C-37. Effects Based Tissue Concentrations for Fish - Lead

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout - Brook	Fish	Fresh	Egg-embryo	Mortality	35.8	NOED	Absorption	Kidney	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Mortality	70	NOED	Absorption	Gill	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Mortality	100	NOED	Absorption	Kidney	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh		Reproduction	60	LOED		Kidney	1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout - Brook	Fish	Fresh	Egg	Reproduction	0.402	NOED	Water	Eggs	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Reproduction	16	NOED	Water	Liver	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Reproduction	54	NOED	Water	Red Blood Cells	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Reproduction	80	NOED	Water	Gill	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Reproduction	100	NOED	Water	Kidney	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Immature	Reproduction	0.6	NOED	Absorption	Muscle	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Reproduction	3.2	NOED	Absorption	Gonad	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Reproduction	4	NOED	Absorption	Red Blood Cells	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Reproduction	6	NOED	Absorption	Spleen	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Egg-embryo	Reproduction	10	NOED	Absorption	Liver	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Reproduction	20	NOED	Absorption	Liver	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Egg-embryo	Reproduction	20	NOED	Absorption	Gill	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Egg-embryo	Reproduction	35.8	NOED	Absorption	Kidney	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Reproduction	70	NOED	Absorption	Gill	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh	Immature	Reproduction	100	NOED	Absorption	Kidney	1976. Holcombe, G.W., D.A. Benoit, E.N. Leonard and J.M. Mckim. J Fish Res Bd Can 33:1731-1741.
Trout - Brook	Fish	Fresh		Reproduction	12	NOED		Kidney	1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout - Brook	Fish	Fresh	Egg	Survival	4.02	NOED	Water	Eggs	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Survival	16	NOED	Water	Liver	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Survival	54	NOED	Water	Red Blood Cells	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Survival	80	NOED	Water	Gill	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Brook	Fish	Fresh	Yearling	Survival	100	NOED	Water	Kidney	1976. Holcombe GW, DA Benoit, EN Leonard, JM McKim. J Fish Res Board Can 33:1731-1741
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.0104	ED08	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.0104	ED08	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.278	ED11	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.294	ED11	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.0104	ED11	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.278	ED11	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.294	ED11	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.0104	ED11	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.278	ED16	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.294	ED16	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.278	ED16	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.294	ED16	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.278	ED19	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.294	ED19	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.278	ED19	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.294	ED19	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.0104	ED21	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.0104	ED21	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.294	ED30	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.278	ED30	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.294	ED30	Ingestion	Digestive Tract	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Fry	Growth	0.278	ED30	Ingestion	Whole Body	2004. Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell. Environ Tox & Chem 23:1902-1911
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.15	NOED	Ingestion	Carcass	1978. Hodson PV, BR Blunt, DJ Spry. Water Res 12:869-878

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Table C-38. Effects Based Tissue Concentrations for Fish - Manganese

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	2.2	ED17	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	2.2	ED41	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	2.2	ED61	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154

Table C-39. Effects Based Tissue Concentrations for Fish - Mercury

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Catfish-Channel	Fish	Fresh	Embryo	Mortality	0.06	LD50	Water	Whole Body	1979. Birge WJ, JA Black, AG Westerman, JE Hudson. The Biogeochemistry of Mercury, pg 629-655
Chum Salmon	Fish	Fresh	Fry	Growth	0.8	ED45	Water	Muscle	1977. Koeller PA, GT Wallace. Mar Sci Comm 3:395-406
Chum Salmon	Fish	Fresh	Fry	Growth	0.8	LOED	Water	Muscle	1977. Koeller PA, GT Wallace. Mar Sci Comm 3:395-406
Chum Salmon	Fish	Fresh	Fry	Growth	0.96	LOED	Water	Liver	1978. Brown DA, TR Parsons. J Fish Res Bd Can 35:880-884
Chum Salmon	Fish	Fresh		Growth	0.009	LOED		Liver	1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Chum Salmon	Fish	Fresh	Fry	Growth	1	NOED	Water	Muscle	1977. Koeller PA, GT Wallace. Mar Sci Comm 3:395-406
Chum Salmon	Fish	Fresh	Fry	Growth	0.17	NOED	Water	Liver	1978. Brown DA, TR Parsons. J Fish Res Bd Can 35:880-884
Chum Salmon	Fish	Fresh	Fry	Mortality	0.8	NOED	Water	Muscle	1977. Koeller PA, GT Wallace. Mar Sci Comm 3:395-406
Climbing perch	Fish	Fresh	NA	Growth	2.8	LOED	Absorption	Muscle	1978. Panigrahi, A.K. and B.N. Misra. Environ Pollut 016:31-39
Climbing perch	Fish	Fresh	NA	Growth	3	LOED	Absorption	Liver	1978. Panigrahi, A.K. and B.N. Misra. Environ Pollut 016:31-39
Climbing perch	Fish	Fresh	NA	Mortality	2.8	NOED	Absorption	Muscle	1978. Panigrahi, A.K. and B.N. Misra. Environ Pollut 016:31-39
Climbing perch	Fish	Fresh	NA	Mortality	3	NOED	Absorption	Liver	1978. Panigrahi, A.K. and B.N. Misra. Environ Pollut 016:31-39
European eel	Fish	Salt and Fresh	NA	Mortality	13.4	LD25	Absorption	Muscle	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	14.5	LD25	Absorption	Digestive Tract	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	15.3	LD25	Absorption	Whole Body	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	18	LD25	Absorption	Bile	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	18.8	LD25	Absorption	Skin	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	48.5	LD25	Absorption	Liver	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	66.9	LD25	Absorption	Gill	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	110	LD25	Absorption	Spleen	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	115.7	LD25	Absorption	Kidney	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	0.4	NOED	Absorption	Bile	1995. Mulsow, S.G. and P.F. Landrum. Chemosphere 31(4):3141-3152
European eel	Fish	Salt and Fresh	NA	Mortality	0.2	NOED	Absorption	Muscle	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	0.4	NOED	Absorption	Skin	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	0.56	NOED	Absorption	Whole Body	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	1.4	NOED	Absorption	Spleen	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	2	NOED	Absorption	Gill	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	4.8	NOED	Absorption	Liver	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	6.7	NOED	Absorption	Digestive Tract	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
European eel	Fish	Salt and Fresh	NA	Mortality	16	NOED	Absorption	Kidney	1977. Noel-Lambot, F. and J.M. Bouquegneau.. Bull Environ Contam Toxicol 18(4):418-424
Fathead minnow	Fish	Fresh	Adult	Growth	1.31	LOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Growth	1.36	LOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Growth	1.36	LOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Growth	4.76	LOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Growth	18.8	LOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Growth	1.2	LOED	Water	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Fathead minnow	Fish	Fresh	Embryo	Growth	10.69	NOED	Water	Whole Body	1975. Olson GF, DJ Mount, VM Snarski, TW Thorslund. Bull Environ Contam Toxicol 14:129-134
Fathead minnow	Fish	Fresh	Adult	Growth	0.32	NOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Growth	0.32	NOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Growth	0.8	NOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Growth	2.64	NOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Growth	9.41	NOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Growth	0.62	NOED	Water	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Fathead minnow	Fish	Fresh	Adult	Mortality	4.18	LOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Mortality	2.75	NOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh	Adult	Mortality	7.6	NOED	Combined	Whole Body	1982. Snarski, V.M., Olson, G.F.. Aquat Toxicol
Fathead minnow	Fish	Fresh		Reproduction	4.47	ED100			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Fathead minnow	Fish	Fresh	Adult	Reproduction	0.39	LOED	Ingestion	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Fathead minnow	Fish	Fresh	Adult	Reproduction	0.86	LOED	Ingestion	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Fathead minnow	Fish	Fresh		Reproduction	2.84	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Fathead minnow	Fish	Fresh	Adult	Reproduction	0.1	NOED	Ingestion	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Fathead minnow	Fish	Fresh	Adult	Reproduction	0.079	NOED	Ingestion	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Fathead minnow	Fish	Fresh	Embryo	Survival	10.69	NOED	Water	Whole Body	1975. Olson GF, DJ Mount, VM Snarski, TW Thorslund. Bull Environ Contam Toxicol 14:129-134
Goldfish	Fish	Fresh	Adult	Mortality	7	LD100	Absorption	Whole Body	1979. Heisinger, J.F., C.D. Hansen, and J.H. Kim.. Arch Environ Contam Toxicol 08:279-283
Goldfish	Fish	Fresh	Adult	Mortality	5.6	LD80	Absorption	Whole Body	1979. Heisinger, J.F., C.D. Hansen, and J.H. Kim.. Arch Environ Contam Toxicol 08:279-283
Goldfish	Fish	Fresh	Adult	Mortality	6.2	NOED	Absorption	Whole Body	1979. Heisinger, J.F., C.D. Hansen, and J.H. Kim.. Arch Environ Contam Toxicol 08:279-283
Grayling	Fish	Fresh	Egg	Growth	3.8	NOED	Water	Whole Body	1998. Vollestad LA, E Fjeld, T Haugen, SA Oxnevad. Environ Pollut 101:349-354
Grayling	Fish	Fresh	Egg	Mortality	3.8	LD53	Water	Whole Body	1998. Vollestad LA, E Fjeld, T Haugen, SA Oxnevad. Environ Pollut 101:349-354
Grayling	Fish	Fresh	Egg	Reproduction	3.8	LOED	Water	Whole Body	1998. Vollestad LA, E Fjeld, T Haugen, SA Oxnevad. Environ Pollut 101:349-354
Guppy	Fish	Fresh	Adult	Mortality	0.2	NOED	Absorption	Whole Body	1979. Kudo, A. and D.C. Mortimer.. Environ Pollut 019:239-245.
Japanese medaka	Fish	Fresh		Reproduction	54	ED100			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Japanese medaka	Fish	Fresh		Reproduction	29	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Killfish	Fish	Fresh	Adult	Mortality	0.44	LOED	Ingestion	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Killfish	Fish	Fresh	Adult	Mortality	0.21	NOED	Ingestion	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Minnows	Fish	Fresh		Growth	4.47	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2

Table C-39. Effects Based Tissue Concentrations for Fish - Mercury

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Minnows	Fish	Fresh		Growth	2.84	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Northern Pike	Fish	Fresh	NS	Mortality	15	LD50	Ingestion	Whole Body	1970. Mieltinen, E Blankenstein, K Rissanen, M Valtonen. FAO Tech Conference 99:171-172
Salmon	Fish	Salt and Fresh		Growth	9.4	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Salmon	Fish	Salt and Fresh		Mortality	3.4	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Salmon	Fish	Salt and Fresh		Reproduction	9.4	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Salmon	Fish	Salt and Fresh		Reproduction	9.4	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Salmon	Fish	Salt and Fresh		Reproduction	3.4	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Salmon-coho	Fish	Salt and Fresh	Juvenile	Mortality	18	LC72	Water	Whole Body	1993. Borgmann, U, WP Norwood, and C Clarke. Hydrobiologia 259:78-89.
Trout - Brook	Fish	Fresh		Growth	3.4	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout - Brook	Fish	Fresh	Adult	Mortality	5	LOED	Water	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Trout - Brook	Fish	Fresh	Adult	Mortality	2.7	NOED	Water	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Trout - Rainbow	Fish	Fresh	Fingerling	Growth	20	LOED	Ingestion	Muscle	1975. Wobeser, G.. J Fish Res Bd Can 32(11), 2015-2023.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.99	NOED	Combined	Whole Body	1978. Phillips GR, DR Buhler. Trans Am Fish Soc 107-853-861
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	2.28	NOED	Water	Whole Body	1978. Phillips GR, DR Buhler. Trans Am Fish Soc 107-853-861
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	2.96	NOED	Combined	Whole Body	1978. Phillips GR, DR Buhler. Trans Am Fish Soc 107-853-861
Trout - Rainbow	Fish	Fresh	Fingerling	Growth	12	NOED	Ingestion	Muscle	1975. Wobeser, G.. J Fish Res Bd Can 32(11), 2015-2023.
Trout - Rainbow	Fish	Fresh	Embryo	Mortality	90.2	LD100	Absorption	Whole Body	1979. Birge WJ, JA Black, AG Westerman, JE Hudson. The Biogeochemistry of Mercury, pg 629-655
Trout - Rainbow	Fish	Fresh	Immature	Mortality	15	LD100	Injection	Whole Body	1979. Hawryshyn, C.W. and W.C. Mackay. Bull Environ Contam Toxicol 23:79-86
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.02	LD50	Injection	Whole Body	1979. Hawryshyn, CW, WC Mackay. Bull Environ Contam Toxicol 23:79-86
Trout - Rainbow	Fish	Fresh	NS	Mortality	11.9	LD50	Ingestion	Whole Body	1970. Mieltinen, E Blankenstein, K Rissanen, M Valtonen. FAO Tech Conference 99:171-172
Trout - Rainbow	Fish	Fresh	Immature	Mortality	5.1	LD50	Injection	Whole Body	1979. Hawryshyn, C.W. and W.C. Mackay. Bull Environ Contam Toxicol 23:79-86
Trout - Rainbow	Fish	Fresh	Embryo	Mortality	26.9	LD76	Absorption	Whole Body	1979. Birge WJ, JA Black, AG Westerman, JE Hudson. The Biogeochemistry of Mercury, pg 629-655
Trout - Rainbow	Fish	Fresh	Fry	Mortality	1.6	LD93	Absorption	Fillet	1973. MacLeod, J.C. and E. Pessah.. J Fish Res Bd Can 30:485-492.
Trout - Rainbow	Fish	Fresh	Fry	Mortality	2.4	LOED	Absorption	Fillet	1973. MacLeod, J.C. and E. Pessah.. J Fish Res Bd Can 30:485-492.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	6.9	LOED	Absorption	Carcass	1975. Wobeser, G.. J Fish Res Bd Can 32(11):2005-2013.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	10	LOED	Ingestion	Whole Body	1975. Wobeser, G.. J Fish Res Bd Can 32(11), 2015-2023.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	2	LOED	Injection	Whole Body	1979. Hawryshyn, C.W. and W.C. Mackay. Bull Environ Contam Toxicol 23:79-86
Trout - Rainbow	Fish	Fresh	Egg-embryo	Mortality	0.07	LOED	Water	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Trout - Rainbow	Fish	Fresh	Larval	Mortality	0.04	LOED	Combined	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Trout - Rainbow	Fish	Fresh	Fry	Mortality	1.2	NOED	Absorption	Fillet	1973. MacLeod, J.C. and E. Pessah.. J Fish Res Bd Can 30:485-492.
Trout - Rainbow	Fish	Fresh	Fry	Mortality	1.4	NOED	Absorption	Fillet	1973. MacLeod, J.C. and E. Pessah.. J Fish Res Bd Can 30:485-492.
Trout - Rainbow	Fish	Fresh	Fry	Mortality	1.6	NOED	Absorption	Fillet	1973. MacLeod, J.C. and E. Pessah.. J Fish Res Bd Can 30:485-492.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	4.8	NOED	Absorption	Carcass	1975. Wobeser, G.. J Fish Res Bd Can 32(11):2005-2013.
Trout - Rainbow	Fish	Fresh	Fingerling	Mortality	27	NOED	Ingestion	Muscle	1975. Wobeser, G.. J Fish Res Bd Can 32(11), 2015-2023.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.1	NOED	Ingestion	Brain	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.1	NOED	Ingestion	Blood	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.1	NOED	Ingestion	Gill	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.1	NOED	Ingestion	Liver	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.1	NOED	Ingestion	Muscle	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.14	NOED	Ingestion	Whole Body	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.3	NOED	Ingestion	Kidney	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.3	NOED	Ingestion	Spleen	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.4	NOED	Ingestion	Gill	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.47	NOED	Ingestion	Whole Body	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.5	NOED	Ingestion	Muscle	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	0.5	NOED	Ingestion	Brain	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	1.1	NOED	Ingestion	Liver	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	1.3	NOED	Ingestion	Spleen	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	1.5	NOED	Ingestion	Kidney	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	1.5	NOED	Ingestion	Posterior Intestine	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	1.5	NOED	Ingestion	Blood	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	5.9	NOED	Ingestion	Posterior Intestine	1985. Boudou, A. and F. Ribeyre. Water Air Soil Pollut. 26:137-148.
Trout - Rainbow	Fish	Fresh	Egg-embryo	Mortality	0.02	NOED	Water	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Trout - Rainbow	Fish	Fresh	Larval	Mortality	0.02	NOED	Combined	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Trout - Rainbow	Fish	Fresh	NA	Survival	12	NOED	Water	Whole Body	1984. Niimi AJ, L Lowe-Jinde. Arch Environ Contam Toxicol 13:303-311
Walleye	Fish	Fresh	Immature	Growth	2.37	LOED	Ingestion	Whole Body	1996. Friedmann, A.S., M.C. Watzin, T. Brinck-Johnsen and J.C. Leiter. Aquat Toxicol 35:265-278
Walleye	Fish	Fresh	Immature	Growth	0.25	NOED	Ingestion	Whole Body	1996. Friedmann, A.S., M.C. Watzin, T. Brinck-Johnsen and J.C. Leiter. Aquat Toxicol 35:265-278
Walleye	Fish	Fresh	Immature	Mortality	2.37	NOED	Ingestion	Whole Body	1996. Friedmann, A.S., M.C. Watzin, T. Brinck-Johnsen and J.C. Leiter. Aquat Toxicol 35:265-278
Walleye	Fish	Fresh	Adult	Reproduction	0.25	LOED	Ingestion	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Walleye	Fish	Fresh	Adult	Reproduction	0.06	NOED	Ingestion	Not Supplied	2005. Beckvar N, TM Dillon, and LB Read. Environ Tox & Chem 24(8):2094-2105
Yellow perch	Fish	Fresh	Adult	Growth	0.135	NOED	Combined	Whole Body	1990. Wiener, J.G., Fitzgerald, W.F., Watras, C.J., Rada, R.G.. Environ Tox & Chem 09:909-918
Zebra Danio	Fish	Fresh	Adult	Mortality	6.84	NOED		Muscle	2008. de Oliveira Ribeiro CA, M-D Nathalie, P Gonzalez, D Yannick, B Jean-Paul, A Boudou, JC Massabuau. Environ Toxicol & Pharm 25:304-309

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Table C-40. Effects Based Tissue Concentrations for Fish - Nickel

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Common carp	Fish	Fresh	Other	Mortality	82.2	LD50	Water	Liver	1992. Sreedevi P, A Suresh, B Sivaramakrishna, B Prabhavathi, K Radhadkrishnaiah. Chemosphere 24:29-36
Common carp	Fish	Fresh	Other	Mortality	97.1	LD50	Water	Brain	1992. Sreedevi P, A Suresh, B Sivaramakrishna, B Prabhavathi, K Radhadkrishnaiah. Chemosphere 24:29-36
Common carp	Fish	Fresh	Other	Mortality	118.1	LD50	Water	White Muscle	1992. Sreedevi P, A Suresh, B Sivaramakrishna, B Prabhavathi, K Radhadkrishnaiah. Chemosphere 24:29-36
Common carp	Fish	Fresh	Other	Mortality	202.8	LD50	Water	Gill	1992. Sreedevi P, A Suresh, B Sivaramakrishna, B Prabhavathi, K Radhadkrishnaiah. Chemosphere 24:29-36
Common carp	Fish	Fresh	Other	Mortality	226.6	LD50	Water	Kidney	1992. Sreedevi P, A Suresh, B Sivaramakrishna, B Prabhavathi, K Radhadkrishnaiah. Chemosphere 24:29-36
Lake Whitefish	Fish	Fresh	Adult	Growth	70	NOED	Ingestion	Intestine	2002. Ptashynski, M.D., J.F. Klaverkamp. Aquat Toxicol 58:249-264
Trout - Rainbow	Fish	Fresh	Immature	Mortality	39.09	LD50	Water	Gill	2004. Brix KV; J Keithly; KD DeForest; J Laughlin. Environ Tox & Chem 23:2221-2228
Trout - Rainbow	Fish	Fresh	Immature	Mortality	122.02	LD50	Water	Gill	2004. Brix KV; J Keithly; KD DeForest; J Laughlin. Environ Tox & Chem 23:2221-2228
Trout - Rainbow	Fish	Fresh	Immature	Mortality	39.09	LD50	Water	Gill	2004. Brix KV; J Keithly; KD DeForest; J Laughlin. Environ Tox & Chem 23:2221-2228
Trout - Rainbow	Fish	Fresh	Immature	Mortality	122.02	LD50	Water	Gill	2004. Brix KV; J Keithly; KD DeForest; J Laughlin. Environ Tox & Chem 23:2221-2228

Table C-41. Effects Based Tissue Concentrations for Fish - PCBs

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Arctic Grayling	Fish	Fresh	Juvenile	Growth	1.68	NOED	Ingestion	Whole Body	2001. Palace, V.P., S.M. Allen-Gil, S.B. Brown, R.E. Evans, D.A. Metner, D.H. Landers, L.R. Curtis, J.F. Klaverkamp, C.L. Baron, W. L. Lockhart. Chemosphere 45:185-193
Arctic Grayling	Fish	Fresh	Juvenile	Growth	36.61	NOED	Ingestion	Adipose	2001. Palace, V.P., S.M. Allen-Gil, S.B. Brown, R.E. Evans, D.A. Metner, D.H. Landers, L.R. Curtis, J.F. Klaverkamp, C.L. Baron, W. L. Lockhart. Chemosphere 45:185-193
Artic char	Fish	Fresh	Adult	Growth	0.129	NOED	Ingestion	Muscle	2005. Maule, AG; EH Jorgensen; MM Vijayan; JEA Killie. Environ Tox & Chem 24:117-124
Artic char	Fish	Fresh	Adult	Growth	0.339	NOED	Ingestion	Kidney	2005. Maule, AG; EH Jorgensen; MM Vijayan; JEA Killie. Environ Tox & Chem 24:117-124
Artic char	Fish	Fresh	Adult	Growth	1.073	NOED	Ingestion	Muscle	2005. Maule, AG; EH Jorgensen; MM Vijayan; JEA Killie. Environ Tox & Chem 24:117-124
Artic char	Fish	Fresh	Adult	Growth	2.032	NOED	Ingestion	Kidney	2005. Maule, AG; EH Jorgensen; MM Vijayan; JEA Killie. Environ Tox & Chem 24:117-124
Artic char	Fish	Fresh	Adult	Growth	8.366	NOED	Ingestion	Muscle	2005. Maule, AG; EH Jorgensen; MM Vijayan; JEA Killie. Environ Tox & Chem 24:117-124
Artic char	Fish	Fresh	Adult	Growth	8.074	NOED	Ingestion	Muscle	2005. Maule, AG; EH Jorgensen; MM Vijayan; JEA Killie. Environ Tox & Chem 24:117-124
Artic char	Fish	Fresh	Adult	Growth	8.094	NOED	Ingestion	Kidney	2005. Maule, AG; EH Jorgensen; MM Vijayan; JEA Killie. Environ Tox & Chem 24:117-124
Artic char	Fish	Fresh	Adult	Growth	18.103	NOED	Ingestion	Kidney	2005. Maule, AG; EH Jorgensen; MM Vijayan; JEA Killie. Environ Tox & Chem 24:117-124
Catfish-Channel	Fish	Fresh	Immature	Growth	3.8	LOED	Ingestion	Brain	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Growth	11.9	LOED	Ingestion	Muscle and Skin	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Growth	14.3	LOED	Ingestion	Whole Body	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Growth	14.6	LOED	Ingestion	Kidney	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Fingerling	Mortality	0.232	NOED	Ingestion	Blood	1976. Hansen LG, WB Wiekhurst, J Simon. J Fish Res Board Can 33:1343-1352
Catfish-Channel	Fish	Fresh	Fingerling	Mortality	1.52	NOED	Ingestion	Testis	1976. Hansen LG, WB Wiekhurst, J Simon. J Fish Res Board Can 33:1343-1352
Catfish-Channel	Fish	Fresh	Fingerling	Mortality	1.646	NOED	Ingestion	Ovary	1976. Hansen LG, WB Wiekhurst, J Simon. J Fish Res Board Can 33:1343-1352
Catfish-Channel	Fish	Fresh	Fingerling	Mortality	2.172	NOED	Ingestion	Whole Body	1976. Hansen LG, WB Wiekhurst, J Simon. J Fish Res Board Can 33:1343-1352
Catfish-Channel	Fish	Fresh	Fingerling	Mortality	2.286	NOED	Ingestion	Carcass	1976. Hansen LG, WB Wiekhurst, J Simon. J Fish Res Board Can 33:1343-1352
Catfish-Channel	Fish	Fresh	Fingerling	Mortality	2.342	NOED	Ingestion	Kidney	1976. Hansen LG, WB Wiekhurst, J Simon. J Fish Res Board Can 33:1343-1352
Catfish-Channel	Fish	Fresh	Immature	Mortality	1.16	NOED	Ingestion	Blood	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Mortality	3.8	NOED	Ingestion	Brain	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Mortality	5.76	NOED	Ingestion	Testis	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Mortality	8.23	NOED	Ingestion	Ovary	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Mortality	10.9	NOED	Ingestion	Whole Body	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Mortality	11.4	NOED	Ingestion	Muscle and Skin	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Mortality	11.7	NOED	Ingestion	Kidney	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Mortality	11.9	NOED	Ingestion	Muscle and Skin	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Mortality	14.3	NOED	Ingestion	Whole Body	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Catfish-Channel	Fish	Fresh	Immature	Mortality	14.6	NOED	Ingestion	Kidney	1976. Hansen, L.G., W.B. Wiekhorst and J. Simon. J Fish Res Bd Can 33:1343-1352.
Common carp	Fish	Fresh	Juvenile	Growth	3.00E-05	NOED	Ingestion	Whole Body	2004. Stapleton HM, RJ Letcher, J Li, JE Baker. Environ Tox & Chem 23:1939-1946
Common carp	Fish	Fresh	Juvenile	Growth	4.00E-05	NOED	Ingestion	Whole Body	2004. Stapleton HM, RJ Letcher, J Li, JE Baker. Environ Tox & Chem 23:1939-1946
Common carp	Fish	Fresh	Juvenile	Growth	6.00E-05	NOED	Ingestion	Whole Body	2004. Stapleton HM, RJ Letcher, J Li, JE Baker. Environ Tox & Chem 23:1939-1946
Common carp	Fish	Fresh	Juvenile	Mortality	3.00E-05	NOED	Ingestion	Whole Body	2004. Stapleton HM, RJ Letcher, J Li, JE Baker. Environ Tox & Chem 23:1939-1946
Common carp	Fish	Fresh	Juvenile	Mortality	4.00E-05	NOED	Ingestion	Whole Body	2004. Stapleton HM, RJ Letcher, J Li, JE Baker. Environ Tox & Chem 23:1939-1946
Common carp	Fish	Fresh	Juvenile	Mortality	6.00E-05	NOED	Ingestion	Whole Body	2004. Stapleton HM, RJ Letcher, J Li, JE Baker. Environ Tox & Chem 23:1939-1946
Fathead minnow	Fish	Fresh	Juvenile	Growth	1115	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	4690	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	1115	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	4690	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Embryo	Growth	7600	NOED	Water	Adipose	1978. DeFoe DL, GD Veith, RW Carlson. J Fish Res Board Can 35:997-1002
Fathead minnow	Fish	Fresh	Juvenile	Growth	946	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	3980	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	1115	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	4690	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	1099	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	3260	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	1120	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	10940	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	1210	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Growth	7920	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh		Mortality	429	LOED			2004. Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins. Environ Tox & Chem 23:1762-1773
Fathead minnow	Fish	Fresh	Juvenile	Mortality	1115	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Mortality	4690	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh		Mortality	105	NOED			2004. Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins. Environ Tox & Chem 23:1762-1773
Fathead minnow	Fish	Fresh	Juvenile	Mortality	1115	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Mortality	4690	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Mortality	946	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Mortality	3980	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Mortality	1115	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Mortality	4690	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Mortality	1099	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Mortality	3260	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532

Table C-41. Effects Based Tissue Concentrations for Fish - PCBs

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Fathead minnow	Fish	Fresh	Juvenile	Mortality	1120	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Mortality	10940	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Mortality	1210	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Mortality	7920	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	1115	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	4690	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	1115	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	4690	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Embryo	Reproduction	7600	NOED	Water	Adipose	1978. DeFoe DL, GD Veith, RW Carlson. J Fish Res Board Can 35:997-1002
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	946	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	3980	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	1115	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	4690	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	1099	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	3260	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	1120	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	10940	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	1210	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Fathead minnow	Fish	Fresh	Juvenile	Reproduction	7920	NOED	Water	Whole Body	1997. Suedel BC, T Dillon, WH Benson. Environ Tox & Chem 16(&):1526-1532
Goldfish	Fish	Fresh	NA	Mortality	250	LD50	Absorption	Whole Body	1972. Hattula, M.I. and O. Karlog. Acta Pharmacol. Toxicol. 31:238-240.
Goldfish	Fish	Fresh	Immature	Mortality	324	LD50	Absorption	Whole Body	1972. Hattula, M.I. and O. Karlog. Acta Pharmacol. Toxicol. 31:238-240.
Guppy	Fish	Fresh	Adult	Mortality	2.6	LD22	Ingestion	Whole Body	1988. Opperhuizen A, SM Schrap. Chemosphere 17:253-262
Guppy	Fish	Fresh	Adult	Mortality	2.6	LD22	Ingestion	Whole Body	1988. Opperhuizen A, SM Schrap. Chemosphere 17:253-262
Japanese medaka	Fish	Fresh	Adult	Reproduction	0.03	ED03	Ingestion	Eggs	2005. Nakayama, K; Y Oshima; K Nagafuchi; T Hano; Y Shimasaki; T Honjo. Environ Tox & Chem 24:591-596
Japanese medaka	Fish	Fresh	Adult	Reproduction	0.031	ED05	Ingestion	Eggs	2005. Nakayama, K; Y Oshima; K Nagafuchi; T Hano; Y Shimasaki; T Honjo. Environ Tox & Chem 24:591-596
Japanese medaka	Fish	Fresh	Adult	Reproduction	0.03	ED06	Ingestion	Eggs	2005. Nakayama, K; Y Oshima; K Nagafuchi; T Hano; Y Shimasaki; T Honjo. Environ Tox & Chem 24:591-596
Japanese medaka	Fish	Fresh	Adult	Reproduction	0.031	ED08	Ingestion	Eggs	2005. Nakayama, K; Y Oshima; K Nagafuchi; T Hano; Y Shimasaki; T Honjo. Environ Tox & Chem 24:591-596
Japanese medaka	Fish	Fresh	Adult	Reproduction	0.03	ED09	Ingestion	Eggs	2005. Nakayama, K; Y Oshima; K Nagafuchi; T Hano; Y Shimasaki; T Honjo. Environ Tox & Chem 24:591-596
Japanese medaka	Fish	Fresh	Adult	Reproduction	0.025	ED11	Ingestion	Eggs	2005. Nakayama, K; Y Oshima; K Nagafuchi; T Hano; Y Shimasaki; T Honjo. Environ Tox & Chem 24:591-596
Japanese medaka	Fish	Fresh	Adult	Reproduction	0.025	NOED	Ingestion	Eggs	2005. Nakayama, K; Y Oshima; K Nagafuchi; T Hano; Y Shimasaki; T Honjo. Environ Tox & Chem 24:591-596
Japanese medaka	Fish	Fresh	Adult	Reproduction	0.031	NOED	Ingestion	Eggs	2005. Nakayama, K; Y Oshima; K Nagafuchi; T Hano; Y Shimasaki; T Honjo. Environ Tox & Chem 24:591-596
Japanese medaka	Fish	Fresh	Adult	Reproduction	0.03	NOED	Ingestion	Eggs	2005. Nakayama, K; Y Oshima; K Nagafuchi; T Hano; Y Shimasaki; T Honjo. Environ Tox & Chem 24:591-596
Killfish	Fish	Fresh	Egg	Growth	0.071	ED126	NA	Eggs	2001. Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan. Environ Tox & Chem 20(2):327-335
Killfish	Fish	Fresh	Egg	Growth	1.3	ED126	NA	Eggs	2001. Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan. Environ Tox & Chem 20(2):327-335
Killfish	Fish	Fresh	Egg	Growth	0.044	ED149	Ingestion	Eggs	2001. Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan. Environ Tox & Chem 20(2):327-335
Killfish	Fish	Fresh	Adult	Growth	15	NOED	Ingestion	Whole Body	2001. Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan. Environ Tox & Chem 20(2):327-335
Killfish	Fish	Fresh	Adult	Reproduction	2.4	NOED	Injection	Eggs	1999. Elskus AA, E Morosson, AE McElroy, JJ Stegeman, DS Woltering. Aquat Toxicol 45:99-113
Killfish	Fish	Fresh	Adult	Reproduction	14.9	NOED	Injection	Eggs	1999. Elskus AA, E Morosson, AE McElroy, JJ Stegeman, DS Woltering. Aquat Toxicol 45:99-113
Killfish	Fish	Fresh	Adult	Reproduction	2	NOED	Injection	Eggs	1999. Elskus AA, E Morosson, AE McElroy, JJ Stegeman, DS Woltering. Aquat Toxicol 45:99-113
Killfish	Fish	Fresh	Adult	Reproduction	14	NOED	Ingestion	Whole Body	2001. Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan. Environ Tox & Chem 20(2):327-335
Killfish	Fish	Fresh	Egg	Reproduction	1.3	NOED	NA	Eggs	2001. Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan. Environ Tox & Chem 20(2):327-335
Killfish	Fish	Fresh	Egg	Reproduction	1.3	NOED	NA	Eggs	2001. Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan. Environ Tox & Chem 20(2):327-335
Killfish	Fish	Fresh	Egg	Reproduction	1.3	NOED	NA	Eggs	2001. Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan. Environ Tox & Chem 20(2):327-335
Killfish	Fish	Fresh	Adult	Survival	15	NOED	Ingestion	Whole Body	2001. Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan. Environ Tox & Chem 20(2):327-335
Killfish	Fish	Fresh	Egg	Survival	1.3	NOED	NA	Eggs	2001. Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan. Environ Tox & Chem 20(2):327-335
Killfish	Fish	Fresh	Egg	Survival	1.3	NOED	NA	Eggs	2001. Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan. Environ Tox & Chem 20(2):327-335
Killifishes	Fish	Fresh	Fry	Mortality	1	NOED	Injection	Whole Body	2005. Duffy JE, Y Li, JT Zelikoff. Bull Environ Contam Toxicol 74:107-113
Largemouth Bass	Fish	Fresh	Adult	Survival	121	NOED	Combined	Whole Body	2004. Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins. Environ Tox & Chem 23:1762-1773
Largemouth Bass	Fish	Fresh	Juvenile	Survival	28	NOED	Combined	Whole Body	2004. Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins. Environ Tox & Chem 23:1762-1773
Minnow	Fish	Fresh		Growth	180	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Minnow	Fish	Fresh	Adult	Growth	180	LOED	Ingestion	Whole Body	1980. Bengtsson, B.E.. Water Res. 14:681-687.
Minnow	Fish	Fresh		Growth	21	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Minnow	Fish	Fresh		Mortality	10	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Minnow	Fish	Fresh	Adult	Mortality	70	LOED	Ingestion	Whole Body	1980. Bengtsson, B.E.. Water Res. 14:681-687.
Minnow	Fish	Fresh	Adult	Reproduction	170	ED83	Ingestion	Whole Body	1980. Bengtsson, B.E.. Water Res. 14:681-687.
Minnow	Fish	Fresh		Reproduction	10	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Minnow	Fish	Fresh	Adult	Reproduction	15	LOED	Ingestion	Whole Body	1980. Bengtsson, B.E.. Water Res. 14:681-687.
Minnow	Fish	Fresh		Reproduction	1.3	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Minnow	Fish	Fresh	Adult	Reproduction	1.6	NOED	Ingestion	Whole Body	1980. Bengtsson, B.E.. Water Res. 14:681-687.
Salmon - Atlantic	Fish	lt and Fresh		Growth	2.4	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Salmon - Atlantic	Fish	lt and Fre	NS	Growth	1.1	LOED	Water	Whole Body	2002. Meador JP, TK Collier and JE Stein. Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Salmon - Atlantic	Fish	lt and Fre	Egg	Mortality	0.54	ED75	Combined	Eggs	1979. Zitko, V., and R.L. Saunders. Bull Environ Contam Toxicol 21:125-130
Salmon - Atlantic	Fish	lt and Fre	Immature	Mortality	44	NOED	Absorption	Whole Body	1986. Carlberg, G.E., K. Martinsen, A. Kringstad, E. Gjessing, M. Grande, T. Kallqvist and J.U. Skare. Arch Environ Contam Toxicol 15:543-548
Salmon - Atlantic	Fish	lt and Fresh		Reproduction	0.42	NOED		Eggs	1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2

Table C-41. Effects Based Tissue Concentrations for Fish - PCBs

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Salmon - Chinook	Fish	lt and Fre	Juvenile	Growth	0.16	NOED	Ingestion	Whole Body	2003. Powell DB, RC Palm Jr. A Skillman, K Godtfredsen. Environ Tox & Chem
Salmon - Chinook	Fish	lt and Fre	Juvenile	Growth	0.95	NOED	Ingestion	Whole Body	2003. Powell DB, RC Palm Jr. A Skillman, K Godtfredsen. Environ Tox & Chem
Salmon - Chinook	Fish	lt and Fre	Juvenile	Growth	0.16	NOED	Ingestion	Whole Body	2003. Powell DB, RC Palm Jr. A Skillman, K Godtfredsen. Environ Tox & Chem
Salmon - Chinook	Fish	lt and Fre	Juvenile	Growth	0.74	NOED	Ingestion	Whole Body	2003. Powell DB, RC Palm Jr. A Skillman, K Godtfredsen. Environ Tox & Chem
Salmon - Chinook	Fish	lt and Fre	Juvenile	Growth	0.95	NOED	Ingestion	Whole Body	2003. Powell DB, RC Palm Jr. A Skillman, K Godtfredsen. Environ Tox & Chem
Salmon - Chinook	Fish	lt and Fre	Juvenile	Growth	0.95	NOED	Ingestion	Whole Body	2003. Powell DB, RC Palm Jr. A Skillman, K Godtfredsen. Environ Tox & Chem
Salmon - Chinook	Fish	lt and Fre	Larval	Mortality	3.6	LD100	Water	Whole Body	1979. Broyles RH, MI Noveck. Toxicol Appl Pharmacol 050:299-308
Salmon - Chinook	Fish	lt and Fre	Fry	Mortality	3.7	LD28	Combined	Whole Body	1979. Broyles, R.H. and M.I. Noveck. Toxicology and Applied Pharmacology 50, 299-308 (1979)
Salmon - Chinook	Fish	lt and Fre	Juvenile	Mortality	60	NOED	Ingestion	Whole Body	2003. Powell DB, RC Palm Jr. A Skillman, K Godtfredsen. Environ Tox & Chem
Salmon - Chinook	Fish	lt and Fre	Juvenile	Mortality	0.98	NOED	Ingestion	Whole Body	2003. Powell DB, RC Palm Jr. A Skillman, K Godtfredsen. Environ Tox & Chem
Salmon-coho	Fish	lt and Fre	Immature	Growth	9.8	LOED	Ingestion	Carcass	1979. Leatherland, J.F., B.A. Sonstegard and N.V. Holdrient. Comp Biochem Physiol 063c:243-246.
Salmon-coho	Fish	lt and Fre	Immature	Growth	43	LOED	Ingestion	Carcass	1979. Leatherland, J.F., B.A. Sonstegard and N.V. Holdrient. Comp Biochem Physiol 063c:243-246.
Salmon-coho	Fish	lt and Fre	Juvenile	Growth	2.3	LOED	Ingestion	Whole Body	1976. Gruger, E.H., T. Hurley and N.L. Karrick. Environ Sci Tech 10:1033-1037
Salmon-coho	Fish	lt and Fre	NS	Growth	250	LOED	Ingestion	Whole Body	2002. Meador JP, TK Collier and JE Stein. Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Salmon-coho	Fish	lt and Fre	Immature	Growth	13.5	NOED	Ingestion	Carcass	1979. Leatherland, J.F., B.A. Sonstegard and N.V. Holdrient. Comp Biochem Physiol 063c:243-246.
Salmon-coho	Fish	lt and Fre	Juvenile	Growth	0.6	NOED	Ingestion	Whole Body	1976. Gruger, E.H., T. Hurley and N.L. Karrick. Environ Sci Tech 10:1033-1037
Salmon-coho	Fish	lt and Fre	Immature	Mortality	645	ED100	Ingestion	Whole Body	1977. Mayer, F.L., P.M. Mehrle, and H.O. Sanders. Arch Environ Contam Toxicol 05:501-511
Salmon-coho	Fish	lt and Fresh		Mortality	645	LOED			2004. Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins. Environ Tox & Chem 23:1762-1773
Salmon-coho	Fish	lt and Fre	Immature	Mortality	0.15	LOED	Injection	Whole Body	1982. Folmar, L.C., W.W. Dickhoff, W.S. Zaugg and H.O. Hodgins. Aquat Toxicol 02:291-299.
Salmon-coho	Fish	lt and Fre	Immature	Mortality	1.05	LOED	Injection	Liver	1982. Folmar, L.C., W.W. Dickhoff, W.S. Zaugg and H.O. Hodgins. Aquat Toxicol 02:291-299.
Salmon-coho	Fish	lt and Fresh		Mortality	54	NOED			2004. Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins. Environ Tox & Chem 23:1762-1773
Sheepshead minnow	Fish	Fresh	Egg	Mortality	5.1	LD33	Absorption	Eggs	1973. Hansen, D.J., S.C. Schimmel and J. Forester. Proceedings of the Twenty-Seventh Annual Conference Southeastern Association fo Game and Fish Commissioners, Hot Springs, Arkansas
Sheepshead minnow	Fish	Fresh	Egg	Mortality	11	LD74	Absorption	Eggs	1973. Hansen, D.J., S.C. Schimmel and J. Forester. Proceedings of the Twenty-Seventh Annual Conference Southeastern Association fo Game and Fish Commissioners, Hot Springs, Arkansas
Sheepshead minnow	Fish	Fresh		Mortality	7	LOED		Eggs	2004. Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins. Environ Tox & Chem 23:1762-1773
Sheepshead minnow	Fish	Fresh	Egg	Mortality	170	LOED	Absorption	Eggs	1973. Hansen, D.J., S.C. Schimmel and J. Forester. Proceedings of the Twenty-Seventh Annual Conference Southeastern Association fo Game and Fish Commissioners, Hot Springs, Arkansas
Sheepshead minnow	Fish	Fresh	Egg-embryo	Mortality	200	LOED	Absorption	Whole Body	1975. Hansen, D.J., S.C. Schimmel and J. Forester. Trans Am Fish Soc 104:584-588
Sheepshead minnow	Fish	Fresh	Juvenile	Mortality	1100	LOED	Absorption	Whole Body	1975. Hansen, D.J., S.C. Schimmel and J. Forester. Trans Am Fish Soc 104:584-588
Sheepshead minnow	Fish	Fresh		Mortality	5.4	NOED		Eggs	2004. Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins. Environ Tox & Chem 23:1762-1773
Sheepshead minnow	Fish	Fresh	Egg	Mortality	0.56	NOED	Absorption	Whole Body	1973. Hansen, D.J., S.C. Schimmel and J. Forester. Proceedings of the Twenty-Seventh Annual Conference Southeastern Association fo Game and Fish Commissioners, Hot Springs, Arkansas
Sheepshead minnow	Fish	Fresh	Egg	Mortality	0.88	NOED	Absorption	Eggs	1973. Hansen, D.J., S.C. Schimmel and J. Forester. Proceedings of the Twenty-Seventh Annual Conference Southeastern Association fo Game and Fish Commissioners, Hot Springs, Arkansas
Sheepshead minnow	Fish	Fresh	Egg	Mortality	27	NOED	Absorption	Eggs	1973. Hansen, D.J., S.C. Schimmel and J. Forester. Proceedings of the Twenty-Seventh Annual Conference Southeastern Association fo Game and Fish Commissioners, Hot Springs, Arkansas
Sheepshead minnow	Fish	Fresh	Adult	Mortality	49	NOED	Absorption	Whole Body	1973. Hansen, D.J., S.C. Schimmel and J. Forester. Proceedings of the Twenty-Seventh Annual Conference Southeastern Association fo Game and Fish Commissioners, Hot Springs, Arkansas
Sheepshead minnow	Fish	Fresh	Egg-embryo	Mortality	57	NOED	Absorption	Whole Body	1975. Hansen, D.J., S.C. Schimmel and J. Forester. Trans Am Fish Soc 104:584-588
Sheepshead minnow	Fish	Fresh	Egg-embryo	Mortality	66	NOED	Absorption	Eggs	1975. Hansen, D.J., S.C. Schimmel and J. Forester. Trans Am Fish Soc 104:584-588
Sheepshead minnow	Fish	Fresh	Adult	Mortality	110	NOED	Absorption	Whole Body	1975. Hansen, D.J., S.C. Schimmel and J. Forester. Trans Am Fish Soc 104:584-588
Sheepshead minnow	Fish	Fresh	Juvenile	Mortality	230	NOED	Absorption	Whole Body	1975. Hansen, D.J., S.C. Schimmel and J. Forester. Trans Am Fish Soc 104:584-588
Sheepshead minnow	Fish	Fresh	Adult	Reproduction	0.88	LOED	Absorption	Whole Body	1973. Hansen, D.J., S.C. Schimmel and J. Forester. Proceedings of the Twenty-Seventh Annual Conference Southeastern Association fo Game and Fish Commissioners, Hot Springs, Arkansas
Sheepshead minnow	Fish	Fresh	Adult	Reproduction	110	NOED	Absorption	Whole Body	1975. Hansen, D.J., S.C. Schimmel and J. Forester. Trans Am Fish Soc 104:584-588
Trout - Brook	Fish	Fresh	Embryo	Growth	31	NOED	Absorption	Whole Body	1978. Mauck, W.L., P.M. Mehrle, and F.L. Mayer.. J Fish Res Bd Can 35:1084-1088.
Trout - Brook	Fish	Fresh	Immature	Growth	39	NOED	Ingestion	Fillet	1978. Addison, R.F., M.E. Zinck and D.E. Willis. Comp Biochem Physiol 061c:323-325.
Trout - Brook	Fish	Fresh	Embryo	Mortality	419	LD100	Absorption	Whole Body	1978. Mauck, W.L., P.M. Mehrle, and F.L. Mayer.. J Fish Res Bd Can 35:1084-1088.
Trout - Brook	Fish	Fresh	Embryo	Mortality	284	LD50	Absorption	Whole Body	1978. Mauck, W.L., P.M. Mehrle, and F.L. Mayer.. J Fish Res Bd Can 35:1084-1088.
Trout - Brook	Fish	Fresh	Egg	Mortality	77.9	LOED	Water	Eggs	1975. Freeman, H.C. and D.R. Idler. Can. J. Biochem., 53:666-670.
Trout - Brook	Fish	Fresh	Embryo	Mortality	125	LOED	Absorption	Whole Body	1978. Mauck, W.L., P.M. Mehrle, and F.L. Mayer.. J Fish Res Bd Can 35:1084-1088.
Trout - Brook	Fish	Fresh	NS	Mortality	0.15	LOED	Combined	Whole Body	2002. Meador JP, TK Collier and JE Stein. Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Trout - Brook	Fish	Fresh	NS	Mortality	12.5	LOED	Water	Whole Body	2002. Meador JP, TK Collier and JE Stein. Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Trout - Brook	Fish	Fresh	Egg	Mortality	0.5	NOED	Water	Eggs	1977. Hansen, D.J., Goodman, L.R., and A.J. Wilson Jr.. Chesapeake Science 18(2):227-232
Trout - Brook	Fish	Fresh	Embryo	Mortality	71	NOED	Absorption	Whole Body	1978. Mauck, W.L., P.M. Mehrle, and F.L. Mayer.. J Fish Res Bd Can 35:1084-1088.
Trout - Brook	Fish	Fresh	Adult	Reproduction	32.8	LOED	Water	Muscle	1975. Freeman, H.C. and D.R. Idler. Can. J. Biochem., 53:666-670.
Trout - Brook	Fish	Fresh	Fry	Survival	125	LOED			2004. Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins. Environ Tox & Chem 23:1762-1773
Trout - Brook	Fish	Fresh	Fry	Survival	71	NOED			2004. Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins. Environ Tox & Chem 23:1762-1773
Trout - Rainbow	Fish	Fresh	Adult	Growth	1.3	ED40	Combined	Fat	1980. Poels, C.L.M., van Der Gaag, M.A., van de Kerkhoff, J.F.J.. Water Research, Vol. 14, pp 1029-1033 (1980)
Trout - Rainbow	Fish	Fresh	Adult	Growth	2.2	ED40	Combined	Fat	1980. Poels, C.L.M., van Der Gaag, M.A., van de Kerkhoff, J.F.J.. Water Research, Vol. 14, pp 1029-1033 (1980)
Trout - Rainbow	Fish	Fresh		Growth	1.6	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout - Rainbow	Fish	Fresh	NS	Growth	150	LOED	Ingestion	Whole Body	2002. Meador JP, TK Collier and JE Stein. Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	82	LOED	Absorption	Muscle	1975. Branson, D.R., G.E. Blau, H.C. Alexander, and W.B. Neely.. Tans. Am. Fish. Soc., 4:785-792.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	2.3	NOED	Ingestion	Liver	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.

Table C-41. Effects Based Tissue Concentrations for Fish - PCBs

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	2.8	NOED	Ingestion	Muscle	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	6.8	NOED	Ingestion	Stomach	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	8.2	NOED	Ingestion	Whole Body	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	11.3	NOED	Ingestion	Gill	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	103	NOED	Ingestion	Visceral Fat	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	81	NOED	Ingestion	Whole Body	1975. Nestel H, Budd J. Can J Comp Med 39:208-215
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0939	NOED	Ingestion	Fillet	2004. Carline RF, PM Barry, HG Ketola. N Am J Aquaculture 66:91-99
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.0939	NOED	Ingestion	Fillet	2004. Carline RF, PM Barry, HG Ketola. N Am J Aquaculture 66:91-99
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	82	NOED	Absorption	Muscle	1975. Branson, D.R., G.E. Blau, H.C. Alexander, and W.B. Neely.. Tans. Am. Fish. Soc., 4:785-792.
Trout - Rainbow	Fish	Fresh	Egg	Mortality	2.7	ED75	Water	Whole Body	1975. Hogan JW, JL Brauhn. Prog Fish Cult 37:229-230
Trout - Rainbow	Fish	Fresh	Fry	Mortality	0.6	LD100	Injection	Whole Body	1991. Walker MK and RE Peterson. Aquat Toxicol 21:219-238
Trout - Rainbow	Fish	Fresh	Fry	Mortality	0.08	LD15	Injection	Whole Body	1991. Walker MK and RE Peterson. Aquat Toxicol 21:219-238
Trout - Rainbow	Fish	Fresh	Fry	Mortality	0.074	LD50	Injection	Whole Body	1991. Walker MK and RE Peterson. Aquat Toxicol 21:219-238
Trout - Rainbow	Fish	Fresh	Fry	Mortality		LD50	Injection	Whole Body	1991. Walker MK and RE Peterson. Aquat Toxicol 21:219-238
Trout - Rainbow	Fish	Fresh	Fry	Mortality	1.348	LD50	Injection	Whole Body	1991. Walker MK and RE Peterson. Aquat Toxicol 21:219-238
Trout - Rainbow	Fish	Fresh	Fry	Mortality		LD50	Injection	Whole Body	1991. Walker MK and RE Peterson. Aquat Toxicol 21:219-238
Trout - Rainbow	Fish	Fresh	Fry	Mortality		LD50	Injection	Whole Body	1991. Walker MK and RE Peterson. Aquat Toxicol 21:219-238
Trout - Rainbow	Fish	Fresh	Fry	Mortality	0.2	LD65	Injection	Whole Body	1991. Walker MK and RE Peterson. Aquat Toxicol 21:219-238
Trout - Rainbow	Fish	Fresh	Egg	Mortality	1.3	LOED	NA	Whole Body	1975. Hogan, J.W., and J.L. Brauhn. The Progressive Fish Culturist 37 (4):229-230
Trout - Rainbow	Fish	Fresh	NS	Mortality	0.28	LOED	Water	Whole Body	2002. Meador JP, TK Collier and JE Stein. Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Trout - Rainbow	Fish	Fresh	NS	Mortality	0.46	LOED	Water	Whole Body	2002. Meador JP, TK Collier and JE Stein. Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Trout - Rainbow	Fish	Fresh	NA	Mortality	2	NOED	Injection	Whole Body	1991. Janz, D.M. and C.D. Metcalfe. Environ Tox & Chem 10:917-923.
Trout - Rainbow	Fish	Fresh	NA	Mortality	2	NOED	Injection	Whole Body	1991. Janz, D.M. and C.D. Metcalfe. Environ Tox & Chem 10:917-923.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	2.3	NOED	Ingestion	Liver	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	2.8	NOED	Ingestion	Muscle	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	6.8	NOED	Ingestion	Stomach	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	8.2	NOED	Ingestion	Whole Body	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	11.3	NOED	Ingestion	Gill	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	103	NOED	Ingestion	Visceral Fat	1974. Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.. J. Agr. Food Chem., 22(4):638-642.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.0939	NOED	Ingestion	Fillet	2004. Carline RF, PM Barry, HG Ketola. N Am J Aquaculture 66:91-99
Trout - Rainbow	Fish	Fresh	Larval	Mortality	1	NOED	Absorption	Whole Body	1980. Guiney, P.D., J.J. Lech, and R.E. Peterson.. Toxicol Appl Pharmacol 053:521-529.
Trout - Rainbow	Fish	Fresh	Larval	Mortality	1	NOED	Absorption	Whole Body	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	2	NOED	Absorption	Heart	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	2.1	NOED	Absorption	Kidney	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	2.7	NOED	Absorption	Liver	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	2.7	NOED	Absorption	Muscle	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	3	NOED	Absorption	Gill	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	3.5	NOED	Absorption	Brain	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	4.2	NOED	Absorption	Whole Body	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	4.8	NOED	Absorption	Carcass	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	8.8	NOED	Absorption	Gonad	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	16.9	NOED	Absorption	Visceral Fat	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Adult	Mortality	19.65	NOED	Absorption	Adipose	1977. Guiney, P.D., R.E. Peterson, M.J. Melancon, Jr., and J.J. Lech.. Toxicol Appl Pharmacol 039:329-338.
Trout - Rainbow	Fish	Fresh	Juvenile	Survival	3.7	NOED	Ingestion	Blood	1975. Nestel H, Budd J. Can J Comp Med 39:208-215
Trout - Rainbow	Fish	Fresh	Juvenile	Survival	81	NOED	Ingestion	Whole Body	1975. Nestel H, Budd J. Can J Comp Med 39:208-215
Trout - Rainbow	Fish	Fresh	Juvenile	Survival	81	NOED	Ingestion	Whole Body	1975. Nestel H, Budd J. Can J Comp Med 39:208-215
Trout -Lake	Fish	Fresh	Larval	Growth	156	ED107	Combined	Whole Body	1981. Mac MJ, JC Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Larval	Growth	202	ED112	Combined	Whole Body	1981. Mac MJ, JC Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Larval	Growth	206	ED113	Combined	Whole Body	1981. Mac MJ, JC Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Larval	Growth	156	ED129	Combined	Whole Body	1981. Mac MJ, JC Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Larval	Growth	202	LOED	Combined	Whole Body	1981. Mac MJ, JC Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Fry	Growth	1.8	LOED	Combined	Whole Body	1981. Mac, M.J. and J.G. Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Fry	Growth	2.4	LOED	Combined	Whole Body	1981. Mac, M.J. and J.G. Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Larval	Growth	182	NOED	Combined	Whole Body	1981. Mac MJ, JC Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Larval	Growth	182	NOED	Combined	Whole Body	1981. Mac MJ, JC Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Larval	Growth	202	NOED	Combined	Whole Body	1981. Mac MJ, JC Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Fry	Growth	26.3	NOED	Combined	Whole Body	1981. Berlin, W.H., R.J. Hesselberg, and M.J. Mac. In Chlorinated Hydrocarbons as a Factor in the Reproduction and Survival of Lake Trout (Salvelinus namaycush) in Lake Michigan. Technical Paper 105. U.S. Fish and Wildlife Service.
Trout -Lake	Fish	Fresh		Growth	26.3	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout -Lake	Fish	Fresh	Fry	Growth	0.76	NOED	Absorption	Whole Body	1981. Mac, M.J. and J.G. Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Fry	Mortality	8.8	LD17	Combined	Whole Body	1979. Broyles, R.H. and M.I. Noveck. Toxicology and Applied Pharmacology 50, 299-308 (1979)
Trout -Lake	Fish	Fresh	Embryo	Mortality	5.40E-05	LD50	Water	Whole Body	1995. Zabel EW, PM Cook, RE Peterson. Environ Tox & Chem 14:2175-2179
Trout -Lake	Fish	Fresh	Embryo	Mortality	0.029	LD50	Water	Whole Body	1995. Zabel EW, PM Cook, RE Peterson. Environ Tox & Chem 14:2175-2179
Trout -Lake	Fish	Fresh	Fry	Mortality	9.2	LD50	Combined	Whole Body	1979. Broyles, R.H. and M.I. Noveck. Toxicology and Applied Pharmacology 50, 299-308 (1979)
Trout -Lake	Fish	Fresh	Fry	Mortality	8.6	LD74	Combined	Whole Body	1979. Broyles, R.H. and M.I. Noveck. Toxicology and Applied Pharmacology 50, 299-308 (1979)
Trout -Lake	Fish	Fresh	Fry	Mortality	8.4	LD87	Combined	Whole Body	1979. Broyles, R.H. and M.I. Noveck. Toxicology and Applied Pharmacology 50, 299-308 (1979)

Table C-41. Effects Based Tissue Concentrations for Fish - PCBs

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout -Lake	Fish	Fresh	Larval	Mortality	7.6	LD91	Water	Whole Body	1979. Broyles RH, MI Noveck. Toxicol Appl Pharmacol 050:299-308
Trout -Lake	Fish	Fresh	Fry	Mortality	1.53	LOED	Combined	Whole Body	1981. Berlin, W.H., R.J. Hesselberg, and M.J. Mac. In Chlorinated Hydrocarbons as a Factor in the Reproduction and Survival of Lake Trout (Salvelinus namaycush) in Lake Michigan. Technical Paper 105. U.S. Fish and Wildlife Service.
Trout -Lake	Fish	Fresh	Larval	Mortality	156	NOED	Combined	Whole Body	1981. Mac MJ, JC Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Larval	Mortality	206	NOED	Combined	Whole Body	1981. Mac MJ, JC Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Fry	Mortality	1.8	NOED	Combined	Whole Body	1981. Mac, M.J. and J.G. Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Fry	Mortality	2.4	NOED	Combined	Whole Body	1981. Mac, M.J. and J.G. Seelye. Bull Environ Contam Toxicol 27:359-367
Trout -Lake	Fish	Fresh	Adult	Reproduction	1.5	LOED	NA	Eggs	1992. Mac, M.J. and T.R. Swartz. Chemosphere 25(1-2):189-192
Zebra Danio	Fish	Fresh	Adult	Growth	2.7	ED59	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Danio	Fish	Fresh	Adult	Growth	0.14	LOED	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Danio	Fish	Fresh	Adult	Growth	1.9	NOED	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Danio	Fish	Fresh	Adult	Mortality	1.1	LD07	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Danio	Fish	Fresh	Adult	Mortality	2.7	LD18	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Danio	Fish	Fresh	Adult	Mortality	1.1	LOED	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Danio	Fish	Fresh	Adult	Mortality	0.14	NOED	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Danio	Fish	Fresh	Adult	Reproduction	1.1	ED47	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Danio	Fish	Fresh	Adult	Reproduction	2.7	ED54	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Danio	Fish	Fresh	Adult	Reproduction	1.1	LOED	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Danio	Fish	Fresh	Adult	Reproduction	0.14	NOED	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Danio	Fish	Fresh	Adult	Reproduction	1.9	NOED	Ingestion	Whole Body	1998. Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren. Arch Environ Contam Toxicol 35:53-57
Zebra Fish	Fish	Fresh	NS	Growth	4240	NOED	Water	Whole Body	1989. Bouraly M, RJ Millischer.. Chemosphere 18:2051-2063
Zebra Fish	Fish	Fresh	NS	Mortality	4240	LD82	Water	Whole Body	1989. Bouraly M, RJ Millischer.. Chemosphere 18:2051-2063

Table C-42. Effects Based Tissue Concentrations for Fish - Selenium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Bluegill	Fish	Fresh	Larval	Mortality	<49.65 (dry wt)	LOEC	NA	Eggs	1984. Bryson WT, WR Garrett, MA Mallin, KA MacPherson, WE Partin, SE Woock. Roxboro Steam Electric Plant 1982 Environmental Monitoring Studies, Volume II, Hyco Reservoir Bioassay Studies, Roxboro, NC: Environmental Technology Section, Carolina Power & Light Company
Bluegill	Fish	Fresh	Adult	Growth	1.8	LOED	Combined	Skeletal Muscle	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Growth	3	LOED	Combined	Testis	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Growth	4.4	LOED	Combined	Ovary	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Growth	9.3	LOED	Combined	Liver	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Immature	Growth	1.2	LOED	Combined	Whole Body	1993. Lemly, A.D.. Aquat Toxicol 27:133-158
Bluegill	Fish	Fresh	NS	Growth	0.92	LOED	NS	Whole Body	2003. Hamilton SJ. Ecotoxicol Environ Saf 56:201-210
Bluegill	Fish	Fresh	Adult	Growth	4.2	NA	Combined	Skeletal Muscle	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Growth	4.5	NA	Combined	Ovary	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Growth	4.6	NA	Combined	Whole Body	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Growth	7.3	NA	Combined	Liver	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Growth	7.6	NA	Combined	Testis	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Growth	3.24	NOED	Combined	Whole Body	1993. Coyle JJ, DR Buckler, CG Ingersoll, JF Fairchild, and TW May. Environ Tox & Chem 12:551-565
Bluegill	Fish	Fresh	Adult	Growth	3.6	NOED	Combined	Whole Body	1993. Coyle JJ, DR Buckler, CG Ingersoll, JF Fairchild, and TW May. Environ Tox & Chem 12:551-565
Bluegill	Fish	Fresh	Immature	Growth	1.2	NOED	Combined	Whole Body	1993. Lemly, A.D.. Aquat Toxicol 27:133-158
Bluegill	Fish	Fresh	NS	Growth	0.66	NOED	NS	Whole Body	2003. Hamilton SJ. Ecotoxicol Environ Saf 56:201-210
Bluegill	Fish	Fresh	Juvenile	Mortality	2.38	LD15	Ingestion	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Juvenile	Mortality	0.98	LD18	Ingestion	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Juvenile	Mortality	0.68	LD20	Water	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Juvenile	Mortality	0.9	LD21	Ingestion	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Juvenile	Mortality	0.8	LD40	Water	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Juvenile	Mortality	1.04	LD47	Water	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Juvenile	Mortality	1.42	LD55	Water	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Juvenile	Mortality	6.49	LD75	Ingestion	Muscle	1985. Finley, K.A.. Bull Environ Contam Toxicol 35:816-825
Bluegill	Fish	Fresh	Juvenile	Mortality	11.77	LD75	Ingestion	Liver	1985. Finley, K.A.. Bull Environ Contam Toxicol 35:816-825
Bluegill	Fish	Fresh	Juvenile	Mortality	2.96	LD88	Water	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Adult	Mortality	3.6	LD92	Combined	Whole Body	1993. Coyle JJ, DR Buckler, CG Ingersoll, JF Fairchild, and TW May. Environ Tox & Chem 12:551-565
Bluegill	Fish	Fresh	Adult	Mortality	2.8	LOED	Combined	Skeletal Muscle	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Mortality	4.2	LOED	Combined	Skeletal Muscle	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Mortality	4.5	LOED	Combined	Ovary	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Mortality	4.6	LOED	Combined	Whole Body	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Mortality	6.3	LOED	Combined	Testis	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Mortality	7.3	LOED	Combined	Liver	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Mortality	7.6	LOED	Combined	Testis	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Mortality	15.8	LOED	Combined	Liver	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Immature	Mortality	1.6	LOED	Combined	Whole Body	1993. Lemly, A.D.. Aquat Toxicol 27:133-158
Bluegill	Fish	Fresh	Juvenile	Mortality	1.91	NOED	Ingestion	Muscle	1985. Finley, K.A.. Bull Environ Contam Toxicol 35:816-825
Bluegill	Fish	Fresh	Juvenile	Mortality	0.5	NOED	Ingestion	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Juvenile	Mortality	0.66	NOED	Ingestion	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Juvenile	Mortality	2.2	NOED	Ingestion	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Adult	Mortality	1.8	NOED	Combined	Skeletal Muscle	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Mortality	3	NOED	Combined	Testis	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Mortality	4.4	NOED	Combined	Ovary	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Mortality	9.3	NOED	Combined	Liver	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Immature	Mortality	2.4	NOED	Absorption	Whole Body	1980. Barrows, M.E., S.R. Petrocelli, K.J. Macek and J.J. Carroll. p. 379-392 in Haque, R., ed. Dynamics, Exposure and Hazard Assessment of Toxic Chemicals
Bluegill	Fish	Fresh	Immature	Mortality	1.6	NOED	Combined	Whole Body	1993. Lemly, A.D.. Aquat Toxicol 27:133-158
Bluegill	Fish	Fresh	Immature	Mortality	0.5	NOED	Absorption	Brain	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	1.3	NOED	Absorption	Stomach	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	2.3	NOED	Absorption	Intestine	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	2.4	NOED	Absorption	Gonad	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	2.9	NOED	Absorption	Plasma	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	3	NOED	Absorption	White Muscle	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	4.7	NOED	Absorption	Whole Body	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	8.3	NOED	Absorption	Gill	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	8.6	NOED	Absorption	Red Blood Cells	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	10.6	NOED	Absorption	Kidney	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	11.9	NOED	Absorption	Liver	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	14.5	NOED	Absorption	Heart	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	Immature	Mortality	19.1	NOED	Absorption	Spleen	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Bluegill	Fish	Fresh	NS	Mortality	25	NS	Ingestion	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100
Bluegill	Fish	Fresh	NS	Mortality	6.2	NS	Ingestion	Muscle	2004. SJ Hamilton. Sci Total Environ 326:1-31
Bluegill	Fish	Fresh	NS	Mortality	1.1	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31

Table C-42. Effects Based Tissue Concentrations for Fish - Selenium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Bluegill	Fish	Fresh	NS	Mortality	5	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Bluegill	Fish	Fresh	NS	Mortality	0.86	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Bluegill	Fish	Fresh	Adult	Reproduction	5.64	ED100	Water	Whole Body	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	6.73	ED100	Water	Ovary	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	6.73	ED100	Water	Ovary	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	7.21	ED100	Water	Ovary	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	5.64	ED88	Water	Whole Body	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	7.07	ED88	Water	Ovary	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	4.6	NA	Combined	Whole Body	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Reproduction	4.6	NA	Combined	Whole Body	1992. Hermanutz, R.O., Allen, K.N., Roush, T.H., and S.F. Hedtke. Environ Tox & Chem 11: 217-224
Bluegill	Fish	Fresh	Adult	Reproduction	0.62	NOED	Water	Whole Body	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	0.658	NOED	Water	Ovary	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	0.658	NOED	Water	Ovary	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	6.73	NOED	Water	Ovary	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	6.73	NOED	Water	Ovary	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	6.73	NOED	Water	Ovary	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	6.73	NOED	Water	Ovary	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	6.73	NOED	Water	Ovary	1986. Gillespie RB, PC Baumann. Trans Am Fish Soc 115:208-213
Bluegill	Fish	Fresh	Adult	Reproduction	3.6	NOED	Combined	Whole Body	1993. Coyle JJ, DR Buckler, CG Ingersoll, JF Fairchild, and TW May. Environ Tox & Chem 12:551-565
Bluegill	Fish	Fresh	Adult	Reproduction	3.6	NOED	Combined	Whole Body	1993. Coyle JJ, DR Buckler, CG Ingersoll, JF Fairchild, and TW May. Environ Tox & Chem 12:551-565
Bluegill	Fish	Fresh	Adult	Reproduction	3.6	NOED	Combined	Whole Body	1993. Coyle JJ, DR Buckler, CG Ingersoll, JF Fairchild, and TW May. Environ Tox & Chem 12:551-565
Bluegill	Fish	Fresh	Adult	Reproduction	3.8	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Bluegill	Fish	Fresh	Juvenile	Survival	0.8	NOED	Water	Whole Body	1993. Cleveland L, EE Little, DR Buckler, and RH Wiedmeyer. Aquat Toxicol
Bluegill	Fish	Fresh	Adult	Survival	3.6	NOED	Combined	Whole Body	1993. Coyle JJ, DR Buckler, CG Ingersoll, JF Fairchild, and TW May. Environ Tox & Chem 12:551-565
Bonytail	Fish	Fresh	NS	Growth	9.4	NS	Water	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100
Bonytail	Fish	Fresh	NA	Growth	1.88	NS	Water	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Fathead minnow	Fish	Fresh	Larval	Growth	10.3	ED28	Ingestion	Whole Body	1986. Bennett, W.N., A.S. Brooks and M.E. Boraas. Arch Environ Contam Toxicol 15:513-517
Fathead minnow	Fish	Fresh	Adult	Growth	0.18	LOED	Absorption	Whole Body	1986. Bertram, P.E. and A.S. Brooks.. Wat. Res. 20(7):877-884.
Fathead minnow	Fish	Fresh	Adult	Growth	1.4	LOED	Ingestion	Whole Body	1989. Ogle, R.S. and A.W. Knight. Arch Environ Contam Toxicol 18:795-803
Fathead minnow	Fish	Fresh	Larval	Growth	8.6	LOED	Ingestion	Whole Body	1986. Bennett, W.N., A.S. Brooks and M.E. Boraas. Arch Environ Contam Toxicol 15:513-517
Fathead minnow	Fish	Fresh	Larval	Growth	12	LOED	Combined	Whole Body	1996. Dobbs, M.G., D.S. Cherry and J. Cairns, Jr.. Environ Tox & Chem 15:340-347
Fathead minnow	Fish	Fresh	Adult	Growth	0.24	NOED	Ingestion	Whole Body	1986. Bertram, P.E. and A.S. Brooks.. Wat. Res. 20(7):877-884.
Fathead minnow	Fish	Fresh	Adult	Growth	0.44	NOED	Combined	Whole Body	1986. Bertram, P.E. and A.S. Brooks.. Wat. Res. 20(7):877-884.
Fathead minnow	Fish	Fresh	Adult	Growth	1.14	NOED	Ingestion	Whole Body	1989. Ogle, R.S. and A.W. Knight. Arch Environ Contam Toxicol 18:795-803
Fathead minnow	Fish	Fresh	Adult	Growth	0.12	NOED	Absorption	Whole Body	1996. Tessier, C. and J-S. Blais.. Ecotoxicol Environ Saf 33:246-252.
Fathead minnow	Fish	Fresh	NS	Growth	1.08	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Fathead minnow	Fish	Fresh	NS	Growth	12.2	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Fathead minnow	Fish	Fresh	Egg	Mortality	2.18	LOED	Ingestion	Ovary	1989. Ogle, R.S. and A.W. Knight. Arch Environ Contam Toxicol 18:795-803
Fathead minnow	Fish	Fresh	Larval	Mortality	17.8	LOED	Combined	Whole Body	1996. Dobbs, M.G., D.S. Cherry and J. Cairns, Jr.. Environ Tox & Chem 15:340-347
Fathead minnow	Fish	Fresh	Larval	Mortality	12.2	NOED	Ingestion	Whole Body	1986. Bennett, W.N., A.S. Brooks and M.E. Boraas. Arch Environ Contam Toxicol 15:513-517
Fathead minnow	Fish	Fresh	NS	Mortality	0.44	NOED	NS	Whole Body	2003. Hamilton SJ. Ecotoxicol Environ Saf 56:201-210
Fathead minnow	Fish	Fresh	Adult	Reproduction	1.5	NOED	Ingestion	Whole Body	1989. Ogle, R.S. and A.W. Knight. Arch Environ Contam Toxicol 18:795-803
Fathead minnow	Fish	Fresh	Adult	Reproduction	1.6	NOED	Ingestion	Muscle	1989. Ogle, R.S. and A.W. Knight. Arch Environ Contam Toxicol 18:795-803
Fathead minnow	Fish	Fresh	Adult	Reproduction	2.18	NOED	Ingestion	Ovary	1989. Ogle, R.S. and A.W. Knight. Arch Environ Contam Toxicol 18:795-803
Largemouth Bass	Fish	Fresh	Larval	Mortality	19	LOAEL	NA	Ovary	1997. Carolina Power and Light. Largemouth bass selenium bioassay, Roxboro, NC: Environmental Sciences Section
Largemouth Bass	Fish	Fresh	Immature	Mortality	0.4	NOED	Absorption	Brain	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	1.4	NOED	Absorption	Stomach	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	1.6	NOED	Absorption	White Muscle	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	1.8	NOED	Absorption	Gonad	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	2.2	NOED	Absorption	Intestine	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	3.1	NOED	Absorption	Whole Body	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	3.3	NOED	Absorption	Plasma	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	8	NOED	Absorption	Gill	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	9.3	NOED	Absorption	Red Blood Cells	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	9.8	NOED	Absorption	Kidney	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	10	NOED	Absorption	Liver	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	13.3	NOED	Absorption	Heart	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Largemouth Bass	Fish	Fresh	Immature	Mortality	17.5	NOED	Absorption	Spleen	1982. Lemly, A.D.. Aquat Toxicol 02:235-252.
Mosquito fish	Fish	Fresh	Adult	Reproduction	2.63	NOED	Combined	Whole Body	2004. Saiki MK, BA Martin, TW May. Arch Environ Contam Toxicol 47:363-369
Mosquito fish	Fish	Fresh	Fry	Reproduction	4.38	NOED	Combined	Whole Body	2004. Saiki MK, BA Martin, TW May. Arch Environ Contam Toxicol 47:363-369
Northern Pike	Fish	Fresh	Egg	Mortality	6.26	NOED	Combined	Eggs	2006. Muscatello JR, PM Bennett, KT Himbeault, AM Belknap, DM Janz. Environ Sci Technol 40:6506-6512
Northern Pike	Fish	Fresh	Adult	Reproduction	1.04	ED01	Combined	Muscle	2006. Muscatello JR, PM Bennett, KT Himbeault, AM Belknap, DM Janz. Environ Sci Technol 40:6506-6512
Northern Pike	Fish	Fresh	Adult	Reproduction	1	ED01	Combined	Whole Body	2006. Muscatello JR, PM Bennett, KT Himbeault, AM Belknap, DM Janz. Environ Sci Technol 40:6506-6512
Northern Pike	Fish	Fresh	Adult	Reproduction	1.81	ED05	Combined	Muscle	2006. Muscatello JR, PM Bennett, KT Himbeault, AM Belknap, DM Janz. Environ Sci Technol 40:6506-6512
Northern Pike	Fish	Fresh	Adult	Reproduction	1.64	ED05	Combined	Whole Body	2006. Muscatello JR, PM Bennett, KT Himbeault, AM Belknap, DM Janz. Environ Sci Technol 40:6506-6512

Table C-42. Effects Based Tissue Concentrations for Fish - Selenium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Northern Pike	Fish	Fresh	Adult	Reproduction	2.77	ED10	Combined	Muscle	2006. Muscatello JR, PM Bennett, KT Himbeault, AM Belknap, DM Janz. Environ Sci Technol 40:6506-6512
Northern Pike	Fish	Fresh	Adult	Reproduction	4.31	ED20	Combined	Muscle	2006. Muscatello JR, PM Bennett, KT Himbeault, AM Belknap, DM Janz. Environ Sci Technol 40:6506-6512
Northern Pike	Fish	Fresh	Adult	Reproduction	3.54	ED20	Combined	Whole Body	2006. Muscatello JR, PM Bennett, KT Himbeault, AM Belknap, DM Janz. Environ Sci Technol 40:6506-6512
Razorback sucker	Fish	Fresh	Adult	Growth	3.24	ED03	Combined	Muscle	2002. Hamilton SJ, KM Holley, KJ Buhl, FA Bullard, LK Watson, SF McDonald. Environ Toxicol 17:297-323
Razorback sucker	Fish	Fresh	Adult	Growth	2.84	ED09	Combined	Muscle	2002. Hamilton SJ, KM Holley, KJ Buhl, FA Bullard, LK Watson, SF McDonald. Environ Toxicol 17:297-323
Razorback sucker	Fish	Fresh	Adult	Growth	3.24	ED09	Combined	Muscle	2002. Hamilton SJ, KM Holley, KJ Buhl, FA Bullard, LK Watson, SF McDonald. Environ Toxicol 17:297-323
Razorback sucker	Fish	Fresh	NS	Growth	5.9	NS	Water	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100
Razorback sucker	Fish	Fresh	NA	Growth	1.18	NS	Water	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Razorback sucker	Fish	Fresh	Egg	Mortality	9.3	NOED	Water	Eggs	2005. Hamilton SJ; KM Holley; KJ Buhl; FA Bullard. Ecotoxicol Environ Saf 61:32-43
Razorback sucker	Fish	Fresh	Egg	Mortality	7.56	NOED	Water	Eggs	2005. Hamilton SJ; KM Holley; KJ Buhl; FA Bullard. Ecotoxicol Environ Saf 61:32-43
Razorback sucker	Fish	Fresh	NS	Mortality	8.7	NS	Ingestion	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100
Razorback sucker	Fish	Fresh	NS	Mortality	5.4	NS	Ingestion	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100
Razorback sucker	Fish	Fresh	NA	Mortality	1.74	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	0.5	ED17	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	0.5	ED41	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	0.5	ED61	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	4.66	ED11	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	4.02	ED12	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	2	ED13	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.6	ED13	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	0.48	ED14	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	2.66	ED14	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	3	ED14	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	4.48	ED14	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	0.64	ED15	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.5	ED16	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	4.36	ED16	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	0.48	ED20	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.44	ED20	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.9	ED22	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.7	ED22	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	4.5	ED26	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.74	ED30	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	6.52	ED30	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	4.02	ED32	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	4.66	ED35	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	2	ED38	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	3.74	ED4	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	3	ED40	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	4.48	ED41	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.4	ED41	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.6	ED41	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	0.48	ED5	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.7	ED58	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	0.64	ED6	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.5	ED6	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	4.5	ED63	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	0.48	ED7	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.74	ED7	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	6.52	ED70	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	1.9	ED8	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	5.4	ED82	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Growth	2.72	ED9	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Growth	0.66	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Growth	0.68	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Growth	0.8	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Immature	Growth	1.6	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Growth	1.7	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Growth	2.01	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Growth	2.16	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Immature	Growth	2.88	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Immature	Growth	4.64	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	NS	Growth	0.66	LOED	NS	Whole Body	2003. Hamilton SJ. Ecotoxicol Environ Saf 56:201-210
Salmon - Chinook	Fish	Salt and Fresh	NS	Growth	0.8	LOED	NS	Whole Body	2003. Hamilton SJ. Ecotoxicol Environ Saf 56:201-210
Salmon - Chinook	Fish	Salt and Fresh	Larval	Growth	0.54	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358

Table C-42. Effects Based Tissue Concentrations for Fish - Selenium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Salmon - Chinook	Fish	Salt and Fresh	Immature	Growth	0.72	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Growth	1.02	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Growth	1.06	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Growth	1.08	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Immature	Growth	1.6	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Immature	Growth	2.52	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	NS	Growth	0.26	NOED	Ingestion	Whole Body	2003. Hamilton SJ. Ecotoxicol Environ Saf 56:201-210
Salmon - Chinook	Fish	Salt and Fresh	NS	Growth	0.18	NOED	NS	Whole Body	2003. Hamilton SJ. Ecotoxicol Environ Saf 56:201-210
Salmon - Chinook	Fish	Salt and Fresh	NS	Growth	0.54	NOED	NS	Whole Body	2003. Hamilton SJ. Ecotoxicol Environ Saf 56:201-210
Salmon - Chinook	Fish	Salt and Fresh	NS	Growth	4.9	NS	Water	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100
Salmon - Chinook	Fish	Salt and Fresh	NS	Growth	4.9	NS	Water	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100
Salmon - Chinook	Fish	Salt and Fresh	NS	Growth	4.9	NS	Water	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100
Salmon - Chinook	Fish	Salt and Fresh	NS	Growth	2.16	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Salmon - Chinook	Fish	Salt and Fresh	NA	Growth	0.98	NS	Water	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	5.7	LD10	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	4.5	LD37	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	1.14	LD53	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	0.92	LD56	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	5.6	LD57	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	4.48	LD72	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	6.52	LD73	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Juvenile	Mortality	5.4	LD84	Ingestion	Whole Body	1990. Hamilton SJ, KJ Buhl, NL Faerber, RH Wiedmeyer, FA Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Mortality	1.08	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Mortality	1.3	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Mortality	4.68	LOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Mortality	0.52	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Mortality	0.8	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Larval	Mortality	2.08	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Immature	Mortality	4.64	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	Immature	Mortality	5.76	NOED	Ingestion	Whole Body	1990. Hamilton, S.J., K.J. Buhl, N.L. Faerber, R.H. Wiedmeyer and F.A. Bullard. Environ Tox & Chem 09:347-358
Salmon - Chinook	Fish	Salt and Fresh	NS	Mortality	0.26	NOED	Ingestion	Whole Body	2003. Hamilton SJ. Ecotoxicol Environ Saf 56:201-210
Salmon - Chinook	Fish	Salt and Fresh	NS	Mortality	3.8	NS	Water	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100
Salmon - Chinook	Fish	Salt and Fresh	NS	Mortality	4.9	NS	Water	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100
Salmon - Chinook	Fish	Salt and Fresh	NS	Mortality	1.08	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Salmon - Chinook	Fish	Salt and Fresh	NS	Mortality	0.8	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Salmon - Chinook	Fish	Salt and Fresh	NS	Mortality	0.86	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Salmon - Chinook	Fish	Salt and Fresh	NA	Mortality	0.76	NS	Water	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Salmon - Chinook	Fish	Salt and Fresh	NA	Mortality	0.98	NS	Water	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Salmon - Chinook	Fish	Salt and Fresh	NS	Mortality	1.3	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Trout - Brook	Fish	Fresh	Adult	Growth	3.8	ED131	NA	Muscle	2005. Holm J, V Palace, P Siwik, G Sterling, R Evans, C Baron, J Werner, K Wautier. Environmental Toxicology and Chemistry 24:2373-2381
Trout - Brook	Fish	Fresh	Egg	Mortality	7.8	NOED	NA	Eggs	2005. Holm J, V Palace, P Siwik, G Sterling, R Evans, C Baron, J Werner, K Wautier. Environmental Toxicology and Chemistry 24:2373-2381
Trout - Brook	Fish	Fresh	Egg	Reproduction	7.8	NOED	NA	Eggs	2005. Holm J, V Palace, P Siwik, G Sterling, R Evans, C Baron, J Werner, K Wautier. Environmental Toxicology and Chemistry 24:2373-2381
Trout-Brown	Fish	Fresh	Larval	Mortality	17.7 (dry wet)	EC10	NA	Eggs	2009. NewFields. Brown trout laboratory reproduction studies conducted in support of development of a site-specific selenium criterion. Unpublished draft report prepared for J.R. Simplot Company, Smoky Canyon Mine, Pocatello, ID, USA.
Trout-Cutthroat	Fish	Fresh	Larval	Mortality	>21.2 (dry wt)	NOEC	NA	Eggs	2000. Kennedy CJ, LE McDonald, R Loverage, MM Strosher. Arch Environ Contam Toxicol 39:49-52
Trout-Cutthroat	Fish	Fresh	Alevin	Mortality	>24.1 (dry wt)	EC10	NA	Eggs	2008. Rudolph B-L, I Andreller, CJ Kennedy. Environ Sci Technol 42:3109-3114
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	7.8	LOED	Ingestion	Kidney	1980. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. The Journal of Nutrition, Vol. 110, No. 12, pp. 2527-2535.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	20	LOED	Ingestion	Liver	1980. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. The Journal of Nutrition, Vol. 110, No. 12, pp. 2527-2535.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Growth	0.92	LOED	Ingestion	Carcass	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Growth	1.74	LOED	Ingestion	Gastrointestinal Tract	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Growth	4.32	LOED	Ingestion	Kidney	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Growth	9.56	LOED	Ingestion	Liver	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.8	NOED	Ingestion	Kidney	1980. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. The Journal of Nutrition, Vol. 110, No. 12, pp. 2527-2535.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	9.2	NOED	Ingestion	Liver	1980. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. The Journal of Nutrition, Vol. 110, No. 12, pp. 2527-2535.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	20	NOED	Ingestion	Liver	1980. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. The Journal of Nutrition, Vol. 110, No. 12, pp. 2527-2535.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Growth	0.32	NOED	Ingestion	Carcass	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Growth	1.92	NOED	Ingestion	Kidney	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Growth	8.84	NOED	Ingestion	Liver	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	NS	Growth	0.36	NOED		Whole Body	2003. Hamilton SJ. Ecotoxicol Environ Saf 56:201-210
Trout - Rainbow	Fish	Fresh	Adult	Growth	1.5	NOED	NA	Muscle	2005. Holm J, V Palace, P Siwik, G Sterling, R Evans, C Baron, J Werner, K Wautier. Environmental Toxicology and Chemistry 24:2373-2381
Trout - Rainbow	Fish	Fresh	NS	Growth	5.2	NS	Water	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100

Table C-42. Effects Based Tissue Concentrations for Fish - Selenium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout - Rainbow	Fish	Fresh	Fry	Mortality	2.1	LD100	Water	Whole Body	1978. Gissel-Nielsen M and G Gissel-Nielsen. Agri Environ.
Trout - Rainbow	Fish	Fresh	Fry	Mortality	2.2	LD100	Water	Whole Body	1978. Gissel-Nielsen M and G Gissel-Nielsen. Agri Environ.
Trout - Rainbow	Fish	Fresh	Fry	Mortality	3.6	LD100	Water	Whole Body	1978. Gissel-Nielsen M and G Gissel-Nielsen. Agri Environ.
Trout - Rainbow	Fish	Fresh	Fry	Mortality	3.6	LD100	Water	Whole Body	1978. Gissel-Nielsen M and G Gissel-Nielsen. Agri Environ.
Trout - Rainbow	Fish	Fresh	Fry	Mortality	5.8	LD100	Water	Whole Body	1978. Gissel-Nielsen M and G Gissel-Nielsen. Agri Environ.
Trout - Rainbow	Fish	Fresh	Fry	Mortality	1.25	LD30	Water	Whole Body	1978. Gissel-Nielsen M and G Gissel-Nielsen. Agri Environ.
Trout - Rainbow	Fish	Fresh	Fry	Mortality	1.04	LD50	Water	Whole Body	1978. Gissel-Nielsen M and G Gissel-Nielsen. Agri Environ.
Trout - Rainbow	Fish	Fresh	Fry	Mortality	1.68	LD75	Water	Whole Body	1978. Gissel-Nielsen M and G Gissel-Nielsen. Agri Environ.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	7.8	LOED	Ingestion	Kidney	1980. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. The Journal of Nutrition, Vol. 110, No. 12, pp. 2527-2535.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	20	LOED	Ingestion	Liver	1980. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. The Journal of Nutrition, Vol. 110, No. 12, pp. 2527-2535.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Mortality	0.92	LOED	Ingestion	Carcass	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Mortality	1.74	LOED	Ingestion	Gastrointestinal Tract	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Mortality	4.32	LOED	Ingestion	Kidney	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Mortality	9.56	LOED	Ingestion	Liver	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1.8	NOED	Ingestion	Kidney	1980. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. The Journal of Nutrition, Vol. 110, No. 12, pp. 2527-2535.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	9.2	NOED	Ingestion	Liver	1980. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. The Journal of Nutrition, Vol. 110, No. 12, pp. 2527-2535.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Mortality	0.32	NOED	Ingestion	Carcass	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Mortality	1.92	NOED	Ingestion	Kidney	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Early Juvenile	Mortality	8.84	NOED	Ingestion	Liver	1982. Hilton, J.W., P.V. Hodson, and S.J. Slinger.. Comp Biochem Physiol 071C:49-55.
Trout - Rainbow	Fish	Fresh	Egg	Mortality	9.9	NOED	NA	Eggs	2005. Holm J, V Palace, P Siwik, G Sterling, R Evans, C Baron, J Werner, K Wautier. Environmental Toxicology and Chemistry 24:2373-2381
Trout - Rainbow	Fish	Fresh	NS	Mortality	5.2	NS	Water	Whole body	2002. Hamilton SJ. Aquat Toxicol 57:85-100
Trout - Rainbow	Fish	Fresh	NS	Mortality	1.04	NS	Ingestion	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Trout - Rainbow	Fish	Fresh	NA	Mortality	1.3	NS	Water	Whole Body	2004. SJ Hamilton. Sci Total Environ 326:1-31
Trout - Rainbow	Fish	Fresh	Egg	Reproduction	9.9	NOED	NA	Eggs	2005. Holm J, V Palace, P Siwik, G Sterling, R Evans, C Baron, J Werner, K Wautier. Environmental Toxicology and Chemistry 24:2373-2381
Trout - Rainbow	Fish	Fresh	Fry	Survival	0.46	NOED	Water	Whole Body	1978. Gissel-Nielsen M and G Gissel-Nielsen. Agri Environ.
Trout - Rainbow	Fish	Fresh	NS	Survival	0.36	NOED		Whole Body	2003. Hamilton SJ. Ecotoxicol Environ Saf 56:201-210
Various	Fish	Salt and Fresh	Various	Various	1.582	AWQC	Water	Various	2004. USEPA Office of Water. Draft Aquatic Life Water Quality Criteria for Selenium.
White sturgeon	Fish	Fresh	Juvenile	Growth	5.24	ED11	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	6.34	ED11	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	6	ED11	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	7.66	ED11	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	8.26	ED11	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	11.96	ED14	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	6.86	ED14	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	8.56	ED14	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	6.56	ED14	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	7.84	ED14	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	19.74	ED14	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	8.44	ED14	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	10.44	ED14	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	7.42	ED14	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	8.56	ED14	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	4.5	ED33	Ingestion	Whole Body	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	7.48	ED33	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	7.2	ED33	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	7.36	ED33	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	7.16	ED33	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	10.34	ED33	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	11.96	ED38	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	6.86	ED38	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	10.44	ED38	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	7.42	ED38	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	8.56	ED38	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	6.88	ED62	Ingestion	Whole Body	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	21.58	ED62	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	10.62	ED62	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	10.02	ED62	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	10.58	ED62	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	10	ED62	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	19.74	ED72	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	8.44	ED72	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	7.42	ED72	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	8.56	ED72	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327

Table C-42. Effects Based Tissue Concentrations for Fish - Selenium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
White sturgeon	Fish	Fresh	Juvenile	Growth	10.44	ED72	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	5.5	ED90	Ingestion	Whole Body	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	25.62	ED90	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	16.54	ED90	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	10.98	ED90	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	10.96	ED90	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	9.68	ED90	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	4.76	NOED	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	3.08	NOED	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	4.24	NOED	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	3.6	NOED	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	4.46	NOED	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	8.26	NOED	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	5.24	NOED	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	6.34	NOED	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	6	NOED	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	7.66	NOED	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	2.94	NOED	Ingestion	Whole Body	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	6.18	NOED	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	4.4	NOED	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	3.82	NOED	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	4.58	NOED	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Growth	4.22	NOED	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Mortality	5.5	NOED	Ingestion	Whole Body	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Mortality	25.62	NOED	Ingestion	Kidney	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Mortality	16.54	NOED	Ingestion	Liver	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Mortality	10.96	NOED	Ingestion	Muscle	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Mortality	10.98	NOED	Ingestion	Gill	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327
White sturgeon	Fish	Fresh	Juvenile	Mortality	9.68	NOED	Ingestion	Plasma	2006. Tashjian DH, SJ The, A Sogmonyan, SSO Hung. Aquat Toxicol. 1:313-327

Table C-43. Effects Based Tissue Concentrations for Fish - Silver

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Bluegill	Fish	Fresh	Juvenile	Growth	0.044	NOED	Water	Whole Body	1974. Coleman RL, JE Cearley. Bull Environ Contam Toxicol 12:53-61
Bluegill	Fish	Fresh	Juvenile	Mortality	0.044	NOED	Water	Whole Body	1974. Coleman RL, JE Cearley. Bull Environ Contam Toxicol 12:53-61
Bluegill	Fish	Fresh	Juvenile	Mortality	0.12	NOED	Water	Whole Body	1974. Coleman RL, JE Cearley. Bull Environ Contam Toxicol 12:53-61
Fathead minnow	Fish	Fresh	Larval	Growth	0.36	ED15	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Egg	Growth	0.536	ED32	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Egg	Growth	0.114	ED33	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Egg	Growth	1.25	ED67	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Egg	Growth	0.644	ED99	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Larval	Growth	0.18	NOED	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Egg	Growth	0.336	NOED	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Egg	Growth	0.14	NOED	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Egg	Mortality	0.644	LD99	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Larval	Mortality	0.564	NOED	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Egg	Mortality	0.114	NOED	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Egg	Mortality	1.25	NOED	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Fathead minnow	Fish	Fresh	Egg	Reproduction	0.644	NOED	Water	Whole Body	2007. Naddy RB, AB Rehner, GR McNerney, JW Gorsuch, JR Kramer, CM Wood. Environ Toxicol & Chem 26(9):1922-1930
Largemouth Bass	Fish	Fresh	Juvenile	Growth	0.16	NOED	Water	Carcass	1974. Coleman RL, JE Cearley. Bull Environ Contam Toxicol 12:53-61
Largemouth Bass	Fish	Fresh	Juvenile	Growth	0.36	NOED	Water	Gill	1974. Coleman RL, JE Cearley. Bull Environ Contam Toxicol 12:53-61
Largemouth Bass	Fish	Fresh	Juvenile	Growth	0.6	NOED	Water	Gut	1974. Coleman RL, JE Cearley. Bull Environ Contam Toxicol 12:53-61
Largemouth Bass	Fish	Fresh	Juvenile	Mortality	0.16	NOED	Water	Carcass	1974. Coleman RL, JE Cearley. Bull Environ Contam Toxicol 12:53-61
Largemouth Bass	Fish	Fresh	Juvenile	Mortality	0.36	NOED	Water	Gill	1974. Coleman RL, JE Cearley. Bull Environ Contam Toxicol 12:53-61
Largemouth Bass	Fish	Fresh	Juvenile	Mortality	0.6	NOED	Water	Gut	1974. Coleman RL, JE Cearley. Bull Environ Contam Toxicol 12:53-61
Trout - Rainbow	Fish	Fresh	Embryo	Growth	0.15	EC11	Absorption	Whole Body	2007. Dethloff, G.M., R.B. Naddy, J.W. Gorsuch. Environmental Toxicology and Chemistry 26: 1717-1725
Trout - Rainbow	Fish	Fresh	Embryo	Growth	0.84	EC14	Absorption	Whole Body	2007. Dethloff, G.M., R.B. Naddy, J.W. Gorsuch. Environmental Toxicology and Chemistry 26: 1717-1725
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.039	NOED	Ingestion	Gill	2001. Galvez, F., C. Hogstrand, J.C. McGeer, C.M. Wood. Aquat Toxicol 55: 95-112
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	19	NOED	Ingestion	Liver	2001. Galvez, F., C. Hogstrand, J.C. McGeer, C.M. Wood. Aquat Toxicol 55: 95-112
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1	NOED	Ingestion	Kidney	2001. Galvez, F., C. Hogstrand, J.C. McGeer, C.M. Wood. Aquat Toxicol 55: 95-112
Trout - Rainbow	Fish	Fresh	Embryo	Mortality	13.3	LD33	Water	Chorion	2001. Guadagnolo, C.M., C.J. Brauner, C.M. Wood. Environ Tox & Chem 20(3):553-560
Trout - Rainbow	Fish	Fresh	Embryo	Mortality	0.24	LD33	Water	Whole Body	2001. Guadagnolo, C.M., C.J. Brauner, C.M. Wood. Environ Tox & Chem 20(3):553-560
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.129	LD50	Water	Gill	2004. Pane, EF; JC McGeer; CM Wood. Environ Tox & Chem 23:1051-1056
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.191	LD50	Water	Gill	2004. Pane, EF; JC McGeer; CM Wood. Environ Tox & Chem 23:1051-1056
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.039	NOED	Ingestion	Gill	2001. Galvez, F., C. Hogstrand, J.C. McGeer, C.M. Wood. Aquat Toxicol 55: 95-112
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	19	NOED	Ingestion	Liver	2001. Galvez, F., C. Hogstrand, J.C. McGeer, C.M. Wood. Aquat Toxicol 55: 95-112
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	1	NOED	Ingestion	Kidney	2001. Galvez, F., C. Hogstrand, J.C. McGeer, C.M. Wood. Aquat Toxicol 55: 95-112
Trout - Rainbow	Fish	Fresh	NS	Mortality	0.838	NOED	Water	Gill	2002. Wood, C.M., M. Grosell, C. Hogstrand, H.Hansen. Aquat Toxicol 56:197-213
Trout - Rainbow	Fish	Fresh	NS	Mortality	0.003	NOED	Water	Whole Body	2002. Wood, C.M., M. Grosell, C. Hogstrand, H.Hansen. Aquat Toxicol 56:197-213
Trout - Rainbow	Fish	Fresh	Embryo	Reproduction	0.24	NOED	Water	Whole Body	2001. Guadagnolo, C.M., C.J. Brauner, C.M. Wood. Environ Tox & Chem 20(3):553-560
Trout - Rainbow	Fish	Fresh	Embryo	Reproduction	13.3	NOED	Water	Chorion	2001. Guadagnolo, C.M., C.J. Brauner, C.M. Wood. Environ Tox & Chem 20(3):553-560

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Table C-44. Effects Based Tissue Concentrations for Fish - Thallium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Bluegill	Fish	Fresh	Immature	Mortality	2.72	NOED	Absorption	Whole Body	1980. Barrows, M.E., S.R. Petrocelli, K.J. Macek and J.J. Carroll. p. 379-392 in Haque, R., ed. Dynamics, Exposure and Hazard Assessment of Toxic Chemicals
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	0.27	ED17	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	0.27	ED41	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	0.27	ED61	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154

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Table C-45. Effects Based Tissue Concentrations for Fish - Vanadium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
American flagfish	Fish	Fresh	Larval	Growth	2.7	LOED	Absorption	Whole Body	1983. Holdway, D.A., J.B. Sprague and J.G. Dick. Water Res. 17:937-941.
American flagfish	Fish	Fresh	Larval	Growth	0.68	NOED	Absorption	Whole Body	1983. Holdway, D.A., J.B. Sprague and J.G. Dick. Water Res. 17:937-941.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.41	ED59	Ingestion	Carcass	1988. Hilton JW and WJ Bettger. Aquat Toxicol 12:63-71
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	1.41	ED59	Ingestion	Liver	1988. Hilton JW and WJ Bettger. Aquat Toxicol 12:63-71
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	5.33	ED68	Ingestion	Carcass	1988. Hilton JW and WJ Bettger. Aquat Toxicol 12:63-71
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	9.57	ED68	Ingestion	Liver	1988. Hilton JW and WJ Bettger. Aquat Toxicol 12:63-71
Trout - Rainbow	Fish	Fresh	Immature	Growth	5.3	ED70	Ingestion	Carcass	1988. Hilton, J.W. and W.J. Bettger. Aquat Toxicol 12:63-71.
Trout - Rainbow	Fish	Fresh	Immature	Growth	9.6	ED70	Ingestion	Liver	1988. Hilton, J.W. and W.J. Bettger. Aquat Toxicol 12:63-71.
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	0.296	ED95	Ingestion	Liver	1988. Hilton JW and WJ Bettger. Aquat Toxicol 12:63-71
Trout - Rainbow	Fish	Fresh	Immature	Growth	0.41	LOED	Ingestion	Carcass	1988. Hilton, J.W. and W.J. Bettger. Aquat Toxicol 12:63-71.
Trout - Rainbow	Fish	Fresh	Immature	Growth	1.4	LOED	Ingestion	Liver	1988. Hilton, J.W. and W.J. Bettger. Aquat Toxicol 12:63-71.
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.03	LD12	Ingestion	Carcass	1988. Hilton JW and WJ Bettger. Aquat Toxicol 12:63-71
Trout - Rainbow	Fish	Fresh	Immature	Mortality	5.3	NOED	Ingestion	Carcass	1988. Hilton, J.W. and W.J. Bettger. Aquat Toxicol 12:63-71.
Trout - Rainbow	Fish	Fresh	Immature	Mortality	9.6	NOED	Ingestion	Liver	1988. Hilton, J.W. and W.J. Bettger. Aquat Toxicol 12:63-71.

Table C-46. Effects Based Tissue Concentrations for Fish - Zinc

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
American flagfish	Fish	Fresh	Immature	Growth	220	LOED	Combined	Whole Body	1976. Spehar, R.L.. J Fish Res Bd Can 33
American flagfish	Fish	Fresh	Immature	Growth	300	LOED	Combined	Whole Body	1976. Spehar, R.L.. J Fish Res Bd Can 33
American flagfish	Fish	Fresh		Growth	200	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
American flagfish	Fish	Fresh	Immature	Growth	190	NOED	Combined	Whole Body	1976. Spehar, R.L.. J Fish Res Bd Can 33
American flagfish	Fish	Fresh	Immature	Growth	230	NOED	Combined	Whole Body	1976. Spehar, R.L.. J Fish Res Bd Can 33
American flagfish	Fish	Fresh	Immature	Growth	58	NOED	Combined	Whole Body	1978. Spehar, R.L., Leonard, E.N., Defoe, D.L.. Trans Am Fish Soc 107(2): 354-360
American flagfish	Fish	Fresh		Growth	150	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
American flagfish	Fish	Fresh	Immature	Mortality	220	LOED	Combined	Whole Body	1976. Spehar, R.L.. J Fish Res Bd Can 33
American flagfish	Fish	Fresh	Immature	Mortality	50	LOED	Combined	Whole Body	1978. Spehar, R.L., Leonard, E.N., Defoe, D.L.. Trans Am Fish Soc 107(2): 354-360
American flagfish	Fish	Fresh	Immature	Mortality	220	NOED	Combined	Whole Body	1976. Spehar, R.L.. J Fish Res Bd Can 33
American flagfish	Fish	Fresh	Immature	Mortality	300	NOED	Combined	Whole Body	1976. Spehar, R.L.. J Fish Res Bd Can 33
American flagfish	Fish	Fresh	Immature	Mortality	50	NOED	Combined	Whole Body	1978. Spehar, R.L., Leonard, E.N., Defoe, D.L.. Trans Am Fish Soc 107(2): 354-360
American flagfish	Fish	Fresh	Immature	Reproduction	58	NOED	Combined	Whole Body	1978. Spehar, R.L., Leonard, E.N., Defoe, D.L.. Trans Am Fish Soc 107(2): 354-360
American flagfish	Fish	Fresh		Reproduction	300	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Bluegill	Fish	Fresh	Adult	Growth	207	ED89	Combined	Liver	2003. Yoo JL, DM Janz. Arch Environ Contam Toxicol 45:110-120
Goldfish	Fish	Fresh	Adult	Mortality	5.76	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	18.98	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	10.82	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	19.61	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	11.46	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	58.98	NOED	Water	Gill	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	3.36	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	10.51	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	5.34	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	15.06	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	10.69	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	21.49	NOED	Water	Liver	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	3.13	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	11.14	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	5.69	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	16.49	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	10.43	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Goldfish	Fish	Fresh	Adult	Mortality	26.96	NOED	Water	Kidney	2005. Zhang YM; DJ Huang; YQ Wang; JH Liu; J Long. Bull Env Cont Tox 75:1191-1199
Guppy	Fish	Fresh		Growth	0.3	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Guppy	Fish	Fresh	Immature	Mortality	0.284	NOED	Combined	Whole Body	1981. Pierson, K.B.. Can J Fish Aquat Sci 38
Guppy	Fish	Fresh		Reproduction	0.3	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Guppy	Fish	Fresh		Reproduction	0.3	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Guppy	Fish	Fresh		Reproduction	0.26	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	4.8	ED17	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	4.8	ED41	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	4.8	ED61	Water	Whole Body	2005. Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash. Sci Total Environ 343:135-154
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	12	NOED	Water	Whole Body	1979. Farmer GJ, D Ashfield, HS Samant. Environ Pollut 019:103-116
Salmon - Atlantic	Fish	Salt and Fresh	Juvenile	Growth	23.6	NOED	Water	Whole Body	1979. Farmer GJ, D Ashfield, HS Samant. Environ Pollut 019:103-116
Salmon - Atlantic	Fish	Salt and Fresh	Immature	Growth	60	NOED	Absorption	Whole Body	1979. Farmer, G.J., D. Ashfield and H.S. Samont. Environ Pollut 019:103-117.
Salmon - Atlantic	Fish	Salt and Fresh		Growth	42	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Salmon - Atlantic	Fish	Salt and Fresh	Immature	Mortality	60	NOED	Absorption	Whole Body	1979. Farmer, G.J., D. Ashfield and H.S. Samont. Environ Pollut 019:103-117.
Salmon-coho	Fish	Salt and Fresh	Juvenile	Mortality	27.2	LC44	Water	Whole Body	1993. Borgmann, U, WP Norwood, and C Clarke. Hydrobiologia 259:78-89.
Salmon-coho	Fish	Salt and Fresh	Juvenile	Mortality	33.4	LC90	Water	Whole Body	1993. Borgmann, U, WP Norwood, and C Clarke. Hydrobiologia 259:78-89.
Salmon-coho	Fish	Salt and Fresh	Juvenile	Mortality	33.4	LC95	Water	Whole Body	1993. Borgmann, U, WP Norwood, and C Clarke. Hydrobiologia 259:78-89.
Three-spined Stickleback	Fish	Fresh	Adult	Mortality	4.05	NOED	Water	Liver	2005. Sanchez W, O Pallvel, L Meunier, M Coquery, J-M Porcher, S Ait-Aissa. Environ Tox and Pharm 19:177-183
Trout - Brook	Fish	Fresh	Juvenile	Growth	42	NOED	Water	Kidney	1979. Holcombe GW, DA Benoit, EN Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Juvenile	Growth	64	NOED	Water	Gill	1979. Holcombe GW, DA Benoit, EN Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Juvenile	Growth	68	NOED	Water	Liver	1979. Holcombe GW, DA Benoit, EN Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Immature	Growth	40	NOED	Absorption	Kidney	1979. Holcombe, G.W., Benoit,D.A. and E.N. Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Immature	Growth	60	NOED	Absorption	Gill	1979. Holcombe, G.W., Benoit,D.A. and E.N. Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Immature	Growth	60	NOED	Absorption	Liver	1979. Holcombe, G.W., Benoit,D.A. and E.N. Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh		Growth	30	NOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout - Brook	Fish	Fresh	Egg-embryo	Mortality	4.5	LOED	Absorption	Whole Body	1979. Holcombe, G.W., Benoit,D.A. and E.N. Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Egg-embryo	Mortality	3.9	NOED	Absorption	Whole Body	1979. Holcombe, G.W., Benoit,D.A. and E.N. Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Immature	Mortality	60	NOED	Absorption	Gill	1979. Holcombe, G.W., Benoit,D.A. and E.N. Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Immature	Mortality	60	NOED	Absorption	Liver	1979. Holcombe, G.W., Benoit,D.A. and E.N. Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Immature	Mortality	60	NOED	Absorption	Kidney	1979. Holcombe, G.W., Benoit,D.A. and E.N. Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh		Reproduction	30	LOED			1984. Dillon TM. Army Corps of Engineers Report Technical Report, D-84-2
Trout - Brook	Fish	Fresh	Juvenile	Reproduction	42	NOED	Water	Kidney	1979. Holcombe GW, DA Benoit, EN Leonard. Trans Am Fish Soc 108:76-87

Table C-46. Effects Based Tissue Concentrations for Fish - Zinc

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Trout - Brook	Fish	Fresh	Juvenile	Reproduction	64	NOED	Water	Gill	1979. Holcombe GW, DA Benoit, EN Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Juvenile	Reproduction	68	NOED	Water	Liver	1979. Holcombe GW, DA Benoit, EN Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Immature	Reproduction	40	NOED	Absorption	Kidney	1979. Holcombe, G.W., Benoit,D.A. and E.N. Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Immature	Reproduction	60	NOED	Absorption	Gill	1979. Holcombe, G.W., Benoit,D.A. and E.N. Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Immature	Reproduction	60	NOED	Absorption	Liver	1979. Holcombe, G.W., Benoit,D.A. and E.N. Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Juvenile	Survival	42	NOED	Water	Kidney	1979. Holcombe GW, DA Benoit, EN Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Juvenile	Survival	64	NOED	Water	Gill	1979. Holcombe GW, DA Benoit, EN Leonard. Trans Am Fish Soc 108:76-87
Trout - Brook	Fish	Fresh	Juvenile	Survival	68	NOED	Water	Liver	1979. Holcombe GW, DA Benoit, EN Leonard. Trans Am Fish Soc 108:76-87
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	38	ED05	Ingestion	Gill	2009. Sappal R, J Burka, S Dawson, C Kamunde. Aquat Toxicol 91:281-290
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	27.4	ED105	Water	Gill	2009. Sappal R, J Burka, S Dawson, C Kamunde. Aquat Toxicol 91:281-290
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	25	ED109	Water	Gill	2009. Sappal R, J Burka, S Dawson, C Kamunde. Aquat Toxicol 91:281-290
Trout - Rainbow	Fish	Fresh	Juvenile	Growth	26	ED13	Ingestion	Gill	2009. Sappal R, J Burka, S Dawson, C Kamunde. Aquat Toxicol 91:281-290
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.27	LD50	Water	Gill	2009. Todd AS, S Brinkman, RE Wolf, PJ Lamothe, KS Smith, JF Ranville. Environ Tox & Chem 28(6):1233-1243
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.54	LD50	Water	Gill	2009. Todd AS, S Brinkman, RE Wolf, PJ Lamothe, KS Smith, JF Ranville. Environ Tox & Chem 28(6):1233-1243
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.27	LD50	Water	Gill	2009. Todd AS, S Brinkman, RE Wolf, PJ Lamothe, KS Smith, JF Ranville. Environ Tox & Chem 28(6):1233-1243
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	0.54	LD50	Water	Gill	2009. Todd AS, S Brinkman, RE Wolf, PJ Lamothe, KS Smith, JF Ranville. Environ Tox & Chem 28(6):1233-1243
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	26	NOED	Ingestion	Gill	2009. Sappal R, J Burka, S Dawson, C Kamunde. Aquat Toxicol 91:281-290
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	38	NOED	Ingestion	Gill	2009. Sappal R, J Burka, S Dawson, C Kamunde. Aquat Toxicol 91:281-290
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	25	NOED	Water	Gill	2009. Sappal R, J Burka, S Dawson, C Kamunde. Aquat Toxicol 91:281-290
Trout - Rainbow	Fish	Fresh	Juvenile	Mortality	27.4	NOED	Water	Gill	2009. Sappal R, J Burka, S Dawson, C Kamunde. Aquat Toxicol 91:281-290
Yellow perch	Fish	Fresh	Immature	Growth	34.44	ED26	NS	Liver	2000. Laflamme J-S, Y Couillard, PGC Campbell and A Hontela. Can J Fish Aquat Sci 57:1692-1700
Yellow perch	Fish	Fresh	Immature	Growth	30.72	ED26	NS	Kidney	2000. Laflamme J-S, Y Couillard, PGC Campbell and A Hontela. Can J Fish Aquat Sci 57:1692-1700
Yellow perch	Fish	Fresh	Immature	Growth	34.44	ED4	NS	Liver	2000. Laflamme J-S, Y Couillard, PGC Campbell and A Hontela. Can J Fish Aquat Sci 57:1692-1700
Yellow perch	Fish	Fresh	Immature	Growth	30.72	ED4	NS	Kidney	2000. Laflamme J-S, Y Couillard, PGC Campbell and A Hontela. Can J Fish Aquat Sci 57:1692-1700

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Table C-47. Acronyms for Effects Based Tissue Concentrations for Fish

ECXX = effect concentration for XX% of test population
EDXX = effect dose for XX% of test population
IPXX = undefined
kg = kilogram
LCXX = concentration lethal to XX% of test population
LDXX = dose lethal to XX% of test population
LOED = lowest observable effect dose
mg = milligram
NA = not applicable
NOED = no observable effect dose
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
ww = wet weight

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Appendix D

Exposure Pathways Amphibians and Reptiles

Table D-1. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum chloride (AlCl3)	American Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1379	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	American Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1663	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	American Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	627	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	American Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	859	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	American Toad	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	American Toad	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	1500	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	American Toad	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	American Toad	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	American Toad	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	1500	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	American Toad	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	500	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum, wire dissolved in HCl	American Toad	Amphibians	Fresh	Reproduction	NR		I	10			ug/L	LAB	1985. Clark and LaZerte. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum nitrate	Common Toad	Amphibians	Fresh	Reproduction	NE		I	22			ug/L	LAB	1997. Sims et al. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum nitrate	Common Toad	Amphibians	Fresh	Reproduction	NE		I	73			ug/L	LAB	1997. Sims et al. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.
Aluminum	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Aluminum chloride (AlCl3)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Aluminum chloride (AlCl3)	Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	umol/L	LAB	1992. Beattie, R.C., R. Tyler-Jones, and M.J. Baxter. The Effects of pH, Aluminium Concentration and Temperature on the Embryonic Development of the European Common Frog, Rana temporaria. J.Zool. (Lond.)228: 557-570.
Aluminum chloride (AlCl3)	Green Tree Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	161.3	NR	NR	ug/L	LAB	1995. Jung, R.E., and C.H. Jagoe. Effects of Low pH and Aluminum on Body Size, Swimming Performance, and Susceptibility to Predation of Green Tree Frog (Hyla cinerea) Tadpoles. Can. J. Zool.73(12): 2171-2183.
Aluminum chloride (AlCl3)	Green Tree Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	163.8	NR	NR	ug/L	LAB	1995. Jung, R.E., and C.H. Jagoe. Effects of Low pH and Aluminum on Body Size, Swimming Performance, and Susceptibility to Predation of Green Tree Frog (Hyla cinerea) Tadpoles. Can. J. Zool.73(12): 2171-2183.
Aluminum chloride (AlCl3)	Green Tree Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	190.5	NR	NR	ug/L	LAB	1995. Jung, R.E., and C.H. Jagoe. Effects of Low pH and Aluminum on Body Size, Swimming Performance, and Susceptibility to Predation of Green Tree Frog (Hyla cinerea) Tadpoles. Can. J. Zool.73(12): 2171-2183.
Aluminum chloride (AlCl3)	Green Tree Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	277	NR	NR	ug/L	LAB	1995. Jung, R.E., and C.H. Jagoe. Effects of Low pH and Aluminum on Body Size, Swimming Performance, and Susceptibility to Predation of Green Tree Frog (Hyla cinerea) Tadpoles. Can. J. Zool.73(12): 2171-2183.
Aluminum chloride (AlCl3)	Green Tree Frog	Amphibians	Fresh	Mortality	LOEC	Not Reported	T	190.5	NR	NR	ug/L	LAB	1995. Jung, R.E., and C.H. Jagoe. Effects of Low pH and Aluminum on Body Size, Swimming Performance, and Susceptibility to Predation of Green Tree Frog (Hyla cinerea) Tadpoles. Can. J. Zool.73(12): 2171-2183.

Table D-1. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum chloride (AlCl3)	Green Tree Frog	Amphibians	Fresh	Mortality	LOEC	Not Reported	T	257.3	NR	NR	ug/L	LAB	1995. Jung, R.E., and C.H. Jagoe. Effects of Low pH and Aluminum on Body Size, Swimming Performance, and Susceptibility to Predation of Green Tree Frog (Hyla cinerea) Tadpoles. Can. J. Zool.73(12): 2171-2183.
Aluminum chloride (AlCl3)	Green Tree Frog	Amphibians	Fresh	Mortality	NOEC	Not Reported	T	405.2	NR	NR	ug/L	LAB	1995. Jung, R.E., and C.H. Jagoe. Effects of Low pH and Aluminum on Body Size, Swimming Performance, and Susceptibility to Predation of Green Tree Frog (Hyla cinerea) Tadpoles. Can. J. Zool.73(12): 2171-2183.
Aluminum chloride (AlCl3)	Green Tree Frog	Amphibians	Fresh	Mortality	NOEC	Not Reported	T	161.3	NR	NR	ug/L	LAB	1995. Jung, R.E., and C.H. Jagoe. Effects of Low pH and Aluminum on Body Size, Swimming Performance, and Susceptibility to Predation of Green Tree Frog (Hyla cinerea) Tadpoles. Can. J. Zool.73(12): 2171-2183.
Aluminum chloride (AlCl3)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Toxicity of Metals and Low pH to Embryos and Larvae of the Jefferson Salamander, Ambystoma jeffersonianum. Arch. Environ. Contam. Toxicol.29(1): 110-114.
Aluminum chloride (AlCl3)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1994. Horne, M.T., and W.A. Dunson. Exclusion of the Jefferson Salamander, Ambystoma jeffersonianum, from Some Potential Breeding Ponds in Pennsylvania: Effects of pH, Temperature, and Metals on Embryonic Development. Arch. Environ. Contam. Toxicol.27(3): 323-330.
Aluminum chloride (AlCl3)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Toxicity of Metals and Low pH to Embryos and Larvae of the Jefferson Salamander, Ambystoma jeffersonianum. Arch. Environ. Contam. Toxicol.29(1): 110-114.
Aluminum chloride (AlCl3)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	T	525	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Aluminum chloride (AlCl3)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	T	525	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Aluminum chloride (AlCl3)	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	471	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	403	NA	NR	ug/L	LAB	1990. Freda, J., and D.G. McDonald. Effects of Aluminum on the Leopard Frog, Rana pipiens: Life Stage Comparisons and Aluminum Uptake. Can. J. Fish. Aquat. Sci.47: 210-216.
Aluminum chloride (AlCl3)	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	811	NA	NR	ug/L	LAB	1990. Freda, J., and D.G. McDonald. Effects of Aluminum on the Leopard Frog, Rana pipiens: Life Stage Comparisons and Aluminum Uptake. Can. J. Fish. Aquat. Sci.47: 210-216.
Aluminum chloride (AlCl3)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Freda, J., and D.G. McDonald. Effects of Aluminum on the Leopard Frog, Rana pipiens: Life Stage Comparisons and Aluminum Uptake. Can. J. Fish. Aquat. Sci.47: 210-216.
Aluminum chloride (AlCl3)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1990. Freda, J., and D.G. McDonald. Effects of Aluminum on the Leopard Frog, Rana pipiens: Life Stage Comparisons and Aluminum Uptake. Can. J. Fish. Aquat. Sci.47: 210-216.
Aluminum chloride (AlCl3)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	125	NA	NR	ug/L	LAB	1990. Freda, J., V. Cavdek, and D.G. McDonald. Role of Organic Complexation in the Toxicity of Aluminum to Rana pipiens Embryos and Bufo americanus Tadpoles. Can. J. Fish. Aquat. Sci.47: 217-224.
Aluminum chloride (AlCl3)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	250	NA	NR	ug/L	LAB	1990. Freda, J., and D.G. McDonald. Effects of Aluminum on the Leopard Frog, Rana pipiens: Life Stage Comparisons and Aluminum Uptake. Can. J. Fish. Aquat. Sci.47: 210-216.
Aluminum chloride (AlCl3)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1990. Freda, J., and D.G. McDonald. Effects of Aluminum on the Leopard Frog, Rana pipiens: Life Stage Comparisons and Aluminum Uptake. Can. J. Fish. Aquat. Sci.47: 210-216.
Aluminum chloride (AlCl3)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1990. Freda, J., and D.G. McDonald. Effects of Aluminum on the Leopard Frog, Rana pipiens: Life Stage Comparisons and Aluminum Uptake. Can. J. Fish. Aquat. Sci.47: 210-216.
Aluminum chloride (AlCl3)	Marbled Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2280	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Aluminum chloride (AlCl3)	Palmate Newt	Amphibians	Fresh	Growth	NR	Not Reported	T	222	NA	NR	ug/L	LAB	1995. Brady, L.D., and R.A. Griffiths. Effects of pH and Aluminium on the Growth and Feeding Behaviour of Smooth and Palmate Newt Larvae. Ecotoxicology4(5): 299-306.
Aluminum chloride (AlCl3)	Smooth Newt	Amphibians	Fresh	Growth	NR	Not Reported	T	222	NA	NR	ug/L	LAB	1995. Brady, L.D., and R.A. Griffiths. Effects of pH and Aluminium on the Growth and Feeding Behaviour of Smooth and Palmate Newt Larvae. Ecotoxicology4(5): 299-306.
Aluminum chloride (AlCl3)	Wood Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	525	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.

Table D-1. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Aluminum

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Aluminum chloride (AlCl3)	Wood Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	525	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Aluminum, wire dissolved in HCl	Wood Frog	Amphibians	Fresh	Reproduction	NR		I	20			ug/L	LAB	1985. Clark and LaZerte. As cited in 2007. Environment Agency. Proposed EQS for Water Framework Directive Annex VIII substances: aluminum (inorganic monomeric). Science Report: SC040038/SR1. SNIFFER Report: WFD52(i). February.

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Table D-2. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Antimony

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Antimony	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Antimony trichloride	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	300	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.

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Table D-3. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Arsenic

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Arsenic	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Arsenic oxide	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	368	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Arsenic oxide	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Arsenic oxide	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	270	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Arsenic oxide	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	249	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.

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Table D-4. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Beryllium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Beryllium nitrate	Frog And Toad Order	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.
Beryllium sulfate	Marbled Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	23700	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Marbled Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	31500	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Marbled Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	31500	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Marbled Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	4210	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Marbled Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	3150	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Marbled Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	31500	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	18200	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	21200	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	3150	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	6830	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	18200	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	18200	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	31500	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	4210	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	18200	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	18200	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	3150	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	31500	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	8020	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.
Beryllium sulfate	Spotted Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	8320	NA	NR	ug/L	LAB	1975. Slonim, A.R., and E.E. Ray. Acute Toxicity of Beryllium Sulfate to Salamander Larvae (Ambystoma spp.). Bull. Environ. Contam. Toxicol.13(3): 307-312.

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Table D-5. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Boron

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Boric acid (H3BO3)	African Clawed Frog	Amphibians	Fresh	Growth	LOEL	Not Reported	T	100000		NC	ug/L	LAB	1999. Bantle, J.A., R.A. Finch, D.J. Fort, E.L. Stover, M. Hull, M. Kumsher-King, and A.M. Gaudet-Hull. Phase III Interlaboratory Study of FETAX Part 3. FETAX Validation Using 12 Compounds with and Without an Exogenous Metabolic Activation System. J. Appl. Toxicol.19(6): 447-472.
Boric acid (H3BO3)	African Clawed Frog	Amphibians	Fresh	Growth	LOEL	Not Reported	T	172000		NC	ug/L	LAB	1999. Bantle, J.A., R.A. Finch, D.J. Fort, E.L. Stover, M. Hull, M. Kumsher-King, and A.M. Gaudet-Hull. Phase III Interlaboratory Study of FETAX Part 3. FETAX Validation Using 12 Compounds with and Without an Exogenous Metabolic Activation System. J. Appl. Toxicol.19(6): 447-472.
Boric acid (H3BO3)	African Clawed Frog	Amphibians	Fresh	Growth	LOEL	Not Reported	T	400000		NC	ug/L	LAB	1999. Bantle, J.A., R.A. Finch, D.J. Fort, E.L. Stover, M. Hull, M. Kumsher-King, and A.M. Gaudet-Hull. Phase III Interlaboratory Study of FETAX Part 3. FETAX Validation Using 12 Compounds with and Without an Exogenous Metabolic Activation System. J. Appl. Toxicol.19(6): 447-472.
Boric acid (H3BO3)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1113000		NC	ug/L	LAB	1999. Bantle, J.A., R.A. Finch, D.J. Fort, E.L. Stover, M. Hull, M. Kumsher-King, and A.M. Gaudet-Hull. Phase III Interlaboratory Study of FETAX Part 3. FETAX Validation Using 12 Compounds with and Without an Exogenous Metabolic Activation System. J. Appl. Toxicol.19(6): 447-472.
Boric acid (H3BO3)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1162000		NC	ug/L	LAB	1999. Bantle, J.A., R.A. Finch, D.J. Fort, E.L. Stover, M. Hull, M. Kumsher-King, and A.M. Gaudet-Hull. Phase III Interlaboratory Study of FETAX Part 3. FETAX Validation Using 12 Compounds with and Without an Exogenous Metabolic Activation System. J. Appl. Toxicol.19(6): 447-472.
Boric acid (H3BO3)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	660000		NC	ug/L	LAB	1999. Bantle, J.A., R.A. Finch, D.J. Fort, E.L. Stover, M. Hull, M. Kumsher-King, and A.M. Gaudet-Hull. Phase III Interlaboratory Study of FETAX Part 3. FETAX Validation Using 12 Compounds with and Without an Exogenous Metabolic Activation System. J. Appl. Toxicol.19(6): 447-472.
Boric acid (H3BO3)	African Clawed Frog	Amphibians	Fresh	Mortality	NOEL	Embryo	T	500000		NC	ug/L	LAB	2001. Fort, D.J., E.L. Stover, J.A. Bantle, J.N. Dumont, and R.A. Finch. Evaluation of a Reproductive Toxicity Assay Using Xenopus laevis: Boric Acid, Cadmium and Ethylene Glycol Monomethyl Ether. J. Appl. Toxicol.21: 41-52.
Boric acid (H3BO3)	African Clawed Frog	Amphibians	Fresh	Reproduction	LOEL	Egg	T	50000		NC	ug/L	LAB	2001. Fort, D.J., E.L. Stover, J.A. Bantle, J.N. Dumont, and R.A. Finch. Evaluation of a Reproductive Toxicity Assay Using Xenopus laevis: Boric Acid, Cadmium and Ethylene Glycol Monomethyl Ether. J. Appl. Toxicol.21: 41-52.
Boric acid (H3BO3)	African Clawed Frog	Amphibians	Fresh	Reproduction	NOEL	Egg	T	10000		NC	ug/L	LAB	2001. Fort, D.J., E.L. Stover, J.A. Bantle, J.N. Dumont, and R.A. Finch. Evaluation of a Reproductive Toxicity Assay Using Xenopus laevis: Boric Acid, Cadmium and Ethylene Glycol Monomethyl Ether. J. Appl. Toxicol.21: 41-52.

Table D-6. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	18	NR	NR	umol/L	LAB	1991. Sunderman, F.W.,Jr., M.C. Plowman, and S.M. Hopfer. Embryotoxicity and Teratogenicity of Cadmium Chloride in Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.21(6): 381-391.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Growth	NOEC	Whole Organism	T	10	NR	NR	umol/L	LAB	1991. Sunderman, F.W.,Jr., M.C. Plowman, and S.M. Hopfer. Embryotoxicity and Teratogenicity of Cadmium Chloride in Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.21(6): 381-391.
Cadmium	African Clawed Frog	Amphibians	Fresh	Growth	NOEC		NR	30			ug/L	NR	. . . .
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Growth	NR	Multiple Tissue/Orgar	T	NR	NA	NR	ug/L	LAB	1997. Herkovits, J., P. Cardellini, C. Pavanati, and C.S. Perez-Coll. Susceptibility of Early Life Stages of Xenopus laevis to Cadmium. Environ. Toxicol. Chem.16(2): 312-316.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Growth	NR		T	30000	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC10	Not Reported	T	14	NR	NR	umol/L	LAB	1991. Sunderman, F.W.,Jr., M.C. Plowman, and S.M. Hopfer. Embryotoxicity and Teratogenicity of Cadmium Chloride in Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.21(6): 381-391.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC100	Not Reported	T	1130	NA	NR	ug/L	LAB	1997. Herkovits, J., P. Cardellini, C. Pavanati, and C.S. Perez-Coll. Susceptibility of Early Life Stages of Xenopus laevis to Cadmium. Environ. Toxicol. Chem.16(2): 312-
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	4000	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1500000	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3200	NA	NR	ug/L	LAB	1982. Canton, J.H., and W. Slooff. Toxicity and Accumulation Studies of Cadmium (Cd2+) with Freshwater Organisms of Different Trophic Levels. Ecotoxicol. Environ. Saf.6(1): 113-128.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Herkovits, J., P. Cardellini, C. Pavanati, and C.S. Perez-Coll. Cadmium Uptake and Bioaccumulation in Xenopus laevis Embryos at Different Developmental Stages. Ecotoxicol. Environ. Saf.39(1): 21-26.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Herkovits, J., P. Cardellini, C. Pavanati, and C.S. Perez-Coll. Cadmium Uptake and Bioaccumulation in Xenopus laevis Embryos at Different Developmental Stages. Ecotoxicol. Environ. Saf.39(1): 21-26.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Herkovits, J., P. Cardellini, C. Pavanati, and C.S. Perez-Coll. Cadmium Uptake and Bioaccumulation in Xenopus laevis Embryos at Different Developmental Stages. Ecotoxicol. Environ. Saf.39(1): 21-26.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Herkovits, J., P. Cardellini, C. Pavanati, and C.S. Perez-Coll. Cadmium Uptake and Bioaccumulation in Xenopus laevis Embryos at Different Developmental Stages. Ecotoxicol. Environ. Saf.39(1): 21-26.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Herkovits, J., P. Cardellini, C. Pavanati, and C.S. Perez-Coll. Cadmium Uptake and Bioaccumulation in Xenopus laevis Embryos at Different Developmental Stages. Ecotoxicol. Environ. Saf.39(1): 21-26.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1998. Herkovits, J., P. Cardellini, C. Pavanati, and C.S. Perez-Coll. Cadmium Uptake and Bioaccumulation in Xenopus laevis Embryos at Different Developmental Stages. Ecotoxicol. Environ. Saf.39(1): 21-26.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Woodall, C., N. MacLean, and F. Crossley. Responses of Trout Fry (Salmo gairdneri) and Xenopus laevis Tadpoles to Cadmium and Zinc. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.89(1): 93-99.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	32	NR	NR	umol/L	LAB	1991. Sunderman, F.W.,Jr., M.C. Plowman, and S.M. Hopfer. Embryotoxicity and Teratogenicity of Cadmium Chloride in Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.21(6): 381-391.
Nitric acid, Cadmium salt	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Nitric acid, Cadmium salt	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3200	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Nitric acid, Cadmium salt	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	15000*	NA	NR	ug/L	LAB	1980. Slooff, W., and R. Baerselman. Comparison of the Usefulness of the Mexican Axolotl (Ambystoma mexicanum) and the Clawed Toad (Xenopus laevis) in Toxicological Bioassays. Bull. Environ. Contam. Toxicol.24(3): 439-443.
Nitric acid, Cadmium salt	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	9600*	NA	NR	ug/L	LAB	1987. De Zwart, D., and W. Slooff. Toxicity of Mixtures of Heavy Metals and Petrochemicals to Xenopus laevis. Bull. Environ. Contam. Toxicol.38: 345-351.

Table D-6. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	African clawed frog	Amphibians	Fresh	Mortality	LC50		NR	4000			ug/L	NR	. . . .
Cadmium	African Clawed Frog	Amphibians	Fresh	Mortality	LC50		NR	3200			ug/L	NR	. . . .
Cadmium	African Clawed Frog	Amphibians	Fresh	Mortality	LC50		NR	7360			ug/L	NR	. . . .
Cadmium	African Clawed Frog	Amphibians	Fresh	Mortality	LC50		NR	11648			ug/L	NR	. . . .
Cadmium	African Clawed Frog	Amphibians	Fresh	Mortality	LC50		NR	20200			ug/L	NR	. . . .
Cadmium	African Clawed Frog	Amphibians	Fresh	Mortality	LC50		NR	32000			ug/L	NR	. . . .
Cadmium	African clawed frog	Amphibians	Fresh	Mortality	LC50		NR	850			ug/L	NR	. . . .
Cadmium	African clawed frog	Amphibians	Fresh	Mortality	LC51		NR	23494			ug/L	NR	. . . .
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC90	Not Reported	T	52	NR	NR	umol/L	LAB	1991. Sunderman, F.W.,Jr., M.C. Plowman, and S.M. Hopfer. Embryotoxicity and Teratogenicity of Cadmium Chloride in Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.21(6): 381-391.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	500	NA	NR	ug/L	LAB	1997. Herkovits, J., P. Cardellini, C. Pavanati, and C.S. Perez-Coll. Susceptibility of Early Life Stages of Xenopus laevis to Cadmium. Environ. Toxicol. Chem.16(2): 312-316.
Cadmium chloride (CdCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	500	NA	NR	ug/L	LAB	1997. Herkovits, J., P. Cardellini, C. Pavanati, and C.S. Perez-Coll. Susceptibility of Early Life Stages of Xenopus laevis to Cadmium. Environ. Toxicol. Chem.16(2): 312-316.
Cadmium	Axolotl	Amphibians	Fresh	Mortality	LC50		NR	205			ug/L	NR	. . . .
Cadmium	Axolotl	Amphibians	Fresh	Mortality	LC50		NR	470			ug/L	NR	. . . .
Cadmium	Axolotl	Amphibians	Fresh	Mortality	LC50		NR	1300			ug/L	NR	. . . .
Cadmium	Black spined toad	Amphibians	Fresh	Mortality	LC50		NR	19810			ug/L	NR	. . . .
Cadmium	Black spined toad	Amphibians	Fresh	Mortality	LC50		NR	11910			ug/L	NR	. . . .
Cadmium	Black spined toad	Amphibians	Fresh	Mortality	LC50		NR	8,180			ug/L	NR	. . . .
Cadmium	Bullfrog	Amphibians	Fresh	Mortality	LC50		NR	3,700			ug/L	NR	. . . .
Cadmium	Columbia spotted frog	Amphibians	Fresh	Mortality	LC50		NR	22490			ug/L	NR	. . . .
Cadmium	Columbia spotted frog	Amphibians	Fresh	Mortality	LC50		NR	16590			ug/L	NR	. . . .
Cadmium	Columbia spotted frog	Amphibians	Fresh	Mortality	LC50		NR	15,810			ug/L	NR	. . . .
Sulfuric acid, Cadmium salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	22420	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid, Cadmium salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	19810	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid, Cadmium salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	11910	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid, Cadmium salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	8180	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	3340			ug/L	NR	. . . .
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	4050			ug/L	NR	. . . .
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	9920			ug/L	NR	. . . .
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	2520			ug/L	NR	. . . .
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	3150			ug/L	NR	. . . .
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	8600			ug/L	NR	. . . .
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	2,230			ug/L	NR	. . . .
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	2,870			ug/L	NR	. . . .
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	7,840			ug/L	NR	. . . .
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	2,080			ug/L	NR	. . . .
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	2,650			ug/L	NR	. . . .
Cadmium	Common toad	Amphibians	Fresh	Mortality	LC50		NR	6,770			ug/L	NR	. . . .
Cadmium	Eastern narrowmouth toad	Amphibians	Fresh	Reproduction	LOEC		NR	1.34			ug/L	NR	. . . .

Table D-6. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Cadmium chloride (CdCl2)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Cadmium	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Cadmium chloride (CdCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2620	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Cadmium chloride (CdCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2780	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Cadmium chloride (CdCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2480	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Cadmium chloride (CdCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2660	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Cadmium chloride (CdCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1960	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Cadmium chloride (CdCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2230	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Cadmium chloride (CdCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1580	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Cadmium chloride (CdCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1810	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Cadmium chloride (CdCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3700	NA	NR	ug/L	LAB	1991. Zettergren, L.D., B.W. Boldt, D.H. Petering, M.S. Goodrich, D.N. Weber, and J.G. Zettergren. Effects of Prolonged Low-Level Cadmium Exposure on the Tadpole Immune System. Toxicol. Lett.55(1): 11-19.
Cadmium	Green frog	Amphibians	Fresh	Mortality	LC50		NR	52000			ug/L	NR	. . . .
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	1554*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	3068*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	307*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	4602*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	61.4*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	6135*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	614*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..

Table D-6. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	307*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	614*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	1554*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	3068*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	307*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	61.4*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	614*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	1554*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	3068*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	307*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	61.4*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	614*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
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Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	3068*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	307*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	61.4*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
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Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	614*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	307*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..

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Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	61.4*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	307*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	614*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	61.4*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
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Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	3068*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	61.4*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1984. Francis, P.C., W.J. Birge, and J.A. Black. Effects of Cadmium-Enriched Sediment on Fish and Amphibian Embryo-Larval Stages. Ecotoxicol. Environ. Saf.8(4): 378-387.
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	614*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	307*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	4602*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	6135*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	1554*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..

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Cadmium chloride (CdCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	3068*	NA	NR	ug/L	LAB	1975. Birge, W.J., J.J. Just, A.G. Westerman, J.A. Black, and O.W. Roberts. Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality. Phase II. Bioassay Procedures Using Developmental Stages as Test Organisms. Res.Rep.No.84, Water Resour.Res.Inst., University of Kentucky, Lexington, KY: 36 p..
Cadmium chloride (CdCl2)	Lowland Frog	Amphibians	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Loumbourdis, N.S., P. Kyriakopoulou-Sklavounou, and G. Zachariadis. Effects of Cadmium Exposure on Bioaccumulation and Larval Growth in the Frog Rana ridibunda. Environ. Pollut.104(3): 429-433.
Cadmium chloride (CdCl2)	Lowland Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	71800	NR	NR	ug/L	LAB	1999. Loumbourdis, N.S., P. Kyriakopoulou-Sklavounou, and G. Zachariadis. Effects of Cadmium Exposure on Bioaccumulation and Larval Growth in the Frog Rana ridibunda. Environ. Pollut.104(3): 429-433.
Cadmium chloride (CdCl2)	Lowland Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Loumbourdis, N.S., P. Kyriakopoulou-Sklavounou, and G. Zachariadis. Effects of Cadmium Exposure on Bioaccumulation and Larval Growth in the Frog Rana ridibunda. Environ. Pollut.104(3): 429-433.
Cadmium chloride (CdCl2)	Lowland Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	200000	NR	NR	ug/L	LAB	1999. Loumbourdis, N.S., P. Kyriakopoulou-Sklavounou, and G. Zachariadis. Effects of Cadmium Exposure on Bioaccumulation and Larval Growth in the Frog Rana ridibunda. Environ. Pollut.104(3): 429-433.
Cadmium chloride (CdCl2)	Lowland Frog	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	12500	NR	NR	ug/L	LAB	1999. Loumbourdis, N.S., P. Kyriakopoulou-Sklavounou, and G. Zachariadis. Effects of Cadmium Exposure on Bioaccumulation and Larval Growth in the Frog Rana ridibunda. Environ. Pollut.104(3): 429-433.
Cadmium chloride (CdCl2)	Marbled Salamander	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	150	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Nitric acid, Cadmium salt	Mexican Axolotl	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Nitric acid, Cadmium salt	Mexican Axolotl	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1300	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Nitric acid, Cadmium salt	Mexican Axolotl	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1300	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Nitric acid, Cadmium salt	Mexican Axolotl	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1300	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Nitric acid, Cadmium salt	Mexican Axolotl	Amphibians	Fresh	Mortality	LC50	Not Reported	T	620*	NA	NR	ug/L	LAB	1980. Slooff, W., and R. Baerselman. Comparison of the Usefulness of the Mexican Axolotl (Ambystoma mexicanum) and the Clawed Toad (Xenopus laevis) in Toxicological Bioassays. Bull. Environ. Contam. Toxicol.24(3): 439-443.
Cadmium	Northern leopard frog	Amphibians	Fresh	Mortality	LC50		NR	3,700			ug/L	NR	. . . .
Cadmium	Northwestern salamander	Amphibians	Fresh	Growth	LOAEL		NR	227			ug/L	NR	. . . .
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Growth	LOEC	Not Reported	T	227.3	NA	NR	ug/L	LAB	1995. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Growth and Bioaccumulation in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.29(4): 492-499.
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Growth	LOEC	Not Reported	T	193.1	NA	NR	ug/L	LAB	1995. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Growth and Bioaccumulation in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.29(4): 492-499.
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Growth	LOEC	Leg	T	44.6	NA	NR	ug/L	LAB	1994. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Limb Regeneration in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.27(3): 318-322.
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Growth	LOEC	Leg	T	193.1	NA	NR	ug/L	LAB	1994. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Limb Regeneration in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.27(3): 318-322.
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Growth	MATC	Not Reported	T	97.2	NA	NR	ug/L	LAB	1995. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Growth and Bioaccumulation in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.29(4): 492-499.
Cadmium	Northwestern salamander	Amphibians	Fresh	Growth	NOAEL		NR	106			ug/L	NR	. . . .
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Growth	NOEC	Not Reported	T	106.3	NA	NR	ug/L	LAB	1995. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Growth and Bioaccumulation in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.29(4): 492-499.

Table D-6. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Growth	NOEC	Not Reported	T	48.9	NA	NR	ug/L	LAB	1995. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Growth and Bioaccumulation in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.29(4): 492-499.
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Growth	NOEC	Leg	T	12.8	NA	NR	ug/L	LAB	1994. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Limb Regeneration in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.27(3): 318-322.
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Growth	NOEC	Leg	T	48.9	NA	NR	ug/L	LAB	1994. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Limb Regeneration in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.27(3): 318-322.
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1995. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Growth and Bioaccumulation in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.29(4): 492-499.
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	468.4	NA	NR	ug/L	LAB	1995. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Growth and Bioaccumulation in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.29(4): 492-499.
Cadmium	Northwestern salamander	Amphibians	Fresh	Mortality	LC50		NR	468			ug/L	NR	. . . .
Cadmium chloride (CdCl2)	Northwestern Salamander	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	535.1	NA	NR	ug/L	LAB	1995. Nebeker, A.V., G.S. Schuytema, and S.L. Ott. Effects of Cadmium on Growth and Bioaccumulation in the Northwestern Salamander Ambystoma gracile. Arch. Environ. Contam. Toxicol.29(4): 492-499.
Cadmium	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	2620			ug/L	NR	. . . .
Cadmium	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	2780			ug/L	NR	. . . .
Cadmium	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	2480			ug/L	NR	. . . .
Cadmium	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	2660			ug/L	NR	. . . .
Cadmium	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	1,580			ug/L	NR	. . . .
Cadmium	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	1,810			ug/L	NR	. . . .
Cadmium	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	200000			ug/L	NR	. . . .
Cadmium	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	250000			ug/L	NR	. . . .
Cadmium	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	146,000			ug/L	NR	. . . .
Cadmium	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	192,000			ug/L	NR	. . . .
Cadmium	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	56,600			ug/L	NR	. . . .
Cadmium	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	75,000			ug/L	NR	. . . .
Nitric acid, Cadmium salt	Spotted Frog	Amphibians	Fresh	Growth	NR	Not Reported	T	100	NR	NR	ug/L	FIELDA	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Nitric acid, Cadmium salt	Spotted Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	22490	NR	NR	ug/L	LAB	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Nitric acid, Cadmium salt	Spotted Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	16590	NR	NR	ug/L	LAB	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Nitric acid, Cadmium salt	Spotted Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	16590	NR	NR	ug/L	LAB	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Nitric acid, Cadmium salt	Spotted Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	15810	NR	NR	ug/L	LAB	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Nitric acid, Cadmium salt	Spotted Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Growth	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Muino, C.V., L. Ferrari, and A. Salibian. Protective Action of Ions Against Cadmium Toxicity to Young Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.45(3): 313-319.
Cadmium	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3340	NA	NR	ug/L	LAB	1990. Muino, C.V., L. Ferrari, and A. Salibian. Protective Action of Ions Against Cadmium Toxicity to Young Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.45(3): 313-319.

Table D-6. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3410	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	4050	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	4760	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	9920	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2520	NA	NR	ug/L	LAB	1990. Muino, C.V., L. Ferrari, and A. Salibian. Protective Action of Ions Against Cadmium Toxicity to Young Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.45(3): 313-319.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2550	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3150	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3400	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	8600	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2230	NA	NR	ug/L	LAB	1990. Muino, C.V., L. Ferrari, and A. Salibian. Protective Action of Ions Against Cadmium Toxicity to Young Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.45(3): 313-319.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2320	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2870	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3110	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	7840	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2080	NA	NR	ug/L	LAB	1990. Muino, C.V., L. Ferrari, and A. Salibian. Protective Action of Ions Against Cadmium Toxicity to Young Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.45(3): 313-319.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2190	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2650	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3060	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium chloride (CdCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	6770	NA	NR	ug/L	LAB	1993. Ferrari, L., A. Salibian, and C.V. Muino. Selective Protection of Temperature Against Cadmium Acute Toxicity to Bufo arenarum Tadpoles. Bull. Environ. Contam. Toxicol.50(2): 212-218.
Cadmium	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Perez-Coll, C.S., and J. Herkovits. Stage-Dependent Uptake of Cadmium by Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.56(4): 663-669.
Cadmium	Toad	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	250	NA	NR	ug/L	LAB	1993. Herkovits, J., and C.S. Perez-Coll. Stage-Dependent Susceptibility of Bufo arenarum Embryos to Cadmium. Bull. Environ. Contam. Toxicol.50(4): 608-611.

Table D-7. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chlordane	Bullfrog	Amphibians	Fresh	Mortality	NR	Not Reported	F	0.5	NA	NR	lb/acre	FIELDN	1963. Mulla, M.S.. Toxicity of Organochlorine Insecticides to the Mosquito Fish Gambusia affinis and the Bullfrog Rana catesbeiana. Mosq. News23(4): 299-303.
Chlordane	Bullfrog	Amphibians	Fresh	Mortality	NR	Not Reported	F	0.1	NA	NR	lb/acre	FIELDN	1963. Mulla, M.S.. Toxicity of Organochlorine Insecticides to the Mosquito Fish Gambusia affinis and the Bullfrog Rana catesbeiana. Mosq. News23(4): 299-303.
Chlordane	Bullfrog	Amphibians	Fresh	Mortality	NR	Not Reported	F	0.5	NA	NR	lb/acre	FIELDA	1963. Mulla, M.S.. Toxicity of Organochlorine Insecticides to the Mosquito Fish Gambusia affinis and the Bullfrog Rana catesbeiana. Mosq. News23(4): 299-303.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Common Or European Toad	Amphibians	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1962. Ludemann, D., and H. Neumann. Uber die Wirkung der Neuzeitlichen Kontaktinsektizide auf die Tiere des Subwassers. Anz. Schaedlingskd. Pflanzenschutz35: 5-9.
Chlordane	Common Or European Toad	Amphibians	Fresh	Mortality	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1960. Ludemann, D., and H. Neumann. Studies on the Acute Toxicity of Modern Contact Insecticides in Fresh Water. II. Z. Angew. Zool.47: 303-321.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Toad	Amphibians	NR	Mortality	LC50	Not Reported	F	3500	NA	NR	ug/L	LAB	1980. Nishiuchi, Y.. Toxicity of Formulated Pesticides to Fresh Water Organisms LXXII. Suisan Zoshoku27(4): 238-244.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Toad	Amphibians	NR	Mortality	LC50	Not Reported	F	NR	NA	NR	ug/L	LAB	1980. Nishiuchi, Y.. Toxicity of Formulated Pesticides to Fresh Water Organisms LXXII. Suisan Zoshoku27(4): 238-244.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Toad	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	A	15000	NA	NR	ug/L	LAB	1984. Juarez, A., and J.A. Guzman. Chronic Effect of Five Organochlorine Insecticides on Larvae of Bufo arenarum (H.). Comun. Biol.2(4): 411-415.
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene	Toad	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	A	5000	NA	NR	ug/L	LAB	1984. Juarez, A., and J.A. Guzman. Chronic Effect of Five Organochlorine Insecticides on Larvae of Bufo arenarum (H.). Comun. Biol.2(4): 411-415.

Table D-8. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium	African clawed frog	Amphibians	Fresh	Growth	NOEC		NR	3,200			ug/L	NR	Sloof and Canton 1983. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Chromium	African clawed frog	Amphibians	Fresh	Mortality	LC50		NR	224910			ug/L	NR	Pant and Gill 1982. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Chromium	Asian bull frog	Amphibians	Fresh	Mortality	LC50		NR	2000			ug/L	NR	Abbasi and Soni 1984. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Chromium	Axolotl	Amphibians	Fresh	Mortality	LC50		NR	2130			ug/L	NR	Birge et al. 1978. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Chromium	Black spined toad	Amphibians	Fresh	Mortality	LC50		NR	57970			ug/L	NR	Khangarot and Ray 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Chromium	Black spined toad	Amphibians	Fresh	Mortality	LC50		NR	49290			ug/L	NR	Khangarot and Ray 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Chromium	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2520	NR	NR	ug/L	LAB	1999. Anusuya, D., and I. Christy. Effects of Chromium Toxicity on Hatching and Development of Tadpoles of Bufo melanostictus. J. Environ. Biol.20(4): 321-323.
Chromium	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	4990	NR	NR	ug/L	LAB	1999. Anusuya, D., and I. Christy. Effects of Chromium Toxicity on Hatching and Development of Tadpoles of Bufo melanostictus. J. Environ. Biol.20(4): 321-323.
Chromium	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	6320	NR	NR	ug/L	LAB	1999. Anusuya, D., and I. Christy. Effects of Chromium Toxicity on Hatching and Development of Tadpoles of Bufo melanostictus. J. Environ. Biol.20(4): 321-323.
Chromium	Common Indian Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1999. Anusuya, D., and I. Christy. Effects of Chromium Toxicity on Hatching and Development of Tadpoles of Bufo melanostictus. J. Environ. Biol.20(4): 321-323.
Chromium	Eastern narrowmouth toad	Amphibians	Fresh	Mortality	LC50		NR	30			ug/L	NR	Birge 1978; Birge et al. 1979. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Chromium oxide (CrO3)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Chromium	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	30	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Chromium	Indian green frog	Amphibians	Fresh	Mortality	LC50		NR	10000			ug/L	NR	Khangarot et al. 1985. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Chromium oxide (CrO3)	Marbled Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2130	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Chromium	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	53430			ug/L	NR	Khangarot and Ray 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	125000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	135000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	168000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	220000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	230000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	240000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.

Table D-8. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	250000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	280000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	370000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	310000	NA	NR	ug/L	LAB	1994. Joshi, S.N., and H.S. Patil. Differential Toxicity of Four Chromium Salts to Male Skipper Frog Rana cyanophlyctis. Environ. Ecol.12(1): 36-38.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	110000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	144000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	175000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	175000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	185000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	190000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	195000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	255000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	58000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	225000	NA	NR	ug/L	LAB	1994. Joshi, S.N., and H.S. Patil. Differential Toxicity of Four Chromium Salts to Male Skipper Frog Rana cyanophlyctis. Environ. Ecol.12(1): 36-38.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	120000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	135000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	140000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	150000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	160000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	185000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	40000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	75000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.

Table D-8. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	98000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	155000	NA	NR	ug/L	LAB	1994. Joshi, S.N., and H.S. Patil. Differential Toxicity of Four Chromium Salts to Male Skipper Frog Rana cyanophlyctis. Environ. Ecol.12(1): 36-38.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	105000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	105000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	115000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	155000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	33000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	53000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	80000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	87000		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR		NR	ug/L	LAB	1992. Joshi, S.N., and H.S. Patil. Effect of Water Temperature, pH and Hardness on the Toxicity of Chromium Trioxide to Female Frog, Rana cyanophlyctis. Proc. Indian Natl. Sci. Acad. Part B Biol. Sci.58(6): 347-350.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	135000	NA	NR	ug/L	LAB	1994. Joshi, S.N., and H.S. Patil. Differential Toxicity of Four Chromium Salts to Male Skipper Frog Rana cyanophlyctis. Environ. Ecol.12(1): 36-38.
Chromium oxide (CrO3)	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	87000	NR	NR	ug/L	LAB	1991. Joshi, S.N., and H.S. Patil. Comparative Toxicity of Three Hexavalent Chromium Compounds to Indian Skipper Frog Rana cyanophlyctis. Environ. Ecol.9(1): 256-259.

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Table D-9. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Scientific Name	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Cobalt chloride (CoCl2)	African Clawed Frog	Amphibians	Fresh	Xenopus laevis	Growth	EC50	Not Reported	T	25	NA	NR	umol/L	LAB	1992. Sunderman, F.WilliamJr. Embryotoxicity and Teratogenicity of Ni2+ and Co2+ in Xenopus laevis. Science and Technology Letters: 467-474.
Cobalt chloride (CoCl2)	African Clawed Frog	Amphibians	Fresh	Xenopus laevis	Growth	LOEC	Not Reported	T	42	NA	NR	umol/L	LAB	1992. Sunderman, F.WilliamJr. Embryotoxicity and Teratogenicity of Ni2+ and Co2+ in Xenopus laevis. Science and Technology Letters: 467-474.
Cobalt chloride (CoCl2)	African Clawed Frog	Amphibians	Fresh	Xenopus laevis	Mortality	LC50	Not Reported	T	10400	NA	NR	umol/L	LAB	1992. Sunderman, F.WilliamJr. Embryotoxicity and Teratogenicity of Ni2+ and Co2+ in Xenopus laevis. Science and Technology Letters: 467-474.
Cobalt	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Gastrophryne carolinensis	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Cobalt nitrate	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Gastrophryne carolinensis	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Cobalt chloride (CoCl2)	Frog	Amphibians	Fresh	Rana hexadactyla	Mortality	LC50	Not Reported	T	30220	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Cobalt chloride (CoCl2)	Frog	Amphibians	Fresh	Rana hexadactyla	Mortality	LC50	Not Reported	T	25990	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Cobalt chloride (CoCl2)	Frog	Amphibians	Fresh	Rana hexadactyla	Mortality	LC50	Not Reported	T	25990	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Cobalt chloride (CoCl2)	Frog	Amphibians	Fresh	Rana hexadactyla	Mortality	LC50	Not Reported	T	17590	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.

Table D-10. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	African Clawed Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	10		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Embryotoxicity and Teratogenicity of Cu2+ and Zn2+ for Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.23(2): 111-120.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	750	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	750	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Copper	African Clawed Frog	Amphibians	Fresh	Growth	LOEL	Whole Organism	T	100	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Copper	African Clawed Frog	Amphibians	Fresh	Growth	LOEL	Whole Organism	T	200	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	LOEL	Not Reported	T	1100		NC	ug/L	LAB	1996. Fort, D.J., and E.L. Stover. Effect of Low-Level Copper and Pentachlorophenol Exposure on Various Early Life Stages of Xenopus laevis. In: D.A.Bengtson and D.S.Henshel (Eds.), Environmental Toxicology and Risk Assessment: Biomarkers and Risk Assessment, 5th Volume, ASTM STP 1306, Philadelphia, PA: 188-203.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	LOEL	Not Reported	T	200		NC	ug/L	LAB	1996. Fort, D.J., and E.L. Stover. Effect of Low-Level Copper and Pentachlorophenol Exposure on Various Early Life Stages of Xenopus laevis. In: D.A.Bengtson and D.S.Henshel (Eds.), Environmental Toxicology and Risk Assessment: Biomarkers and Risk Assessment, 5th Volume, ASTM STP 1306, Philadelphia, PA: 188-203.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	LOEL	Not Reported	T	45		NC	ug/L	LAB	1996. Fort, D.J., and E.L. Stover. Effect of Low-Level Copper and Pentachlorophenol Exposure on Various Early Life Stages of Xenopus laevis. In: D.A.Bengtson and D.S.Henshel (Eds.), Environmental Toxicology and Risk Assessment: Biomarkers and Risk Assessment, 5th Volume, ASTM STP 1306, Philadelphia, PA: 188-203.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	LOEL	Not Reported	T	670		NC	ug/L	LAB	1996. Fort, D.J., and E.L. Stover. Effect of Low-Level Copper and Pentachlorophenol Exposure on Various Early Life Stages of Xenopus laevis. In: D.A.Bengtson and D.S.Henshel (Eds.), Environmental Toxicology and Risk Assessment: Biomarkers and Risk Assessment, 5th Volume, ASTM STP 1306, Philadelphia, PA: 188-203.
Copper chloride (CuCl2)	African Clawed Frog	Amphibians	Fresh	Growth	NOEC	Whole Organism	T	5.6		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Embryotoxicity and Teratogenicity of Cu2+ and Zn2+ for Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.23(2): 111-120.
Copper chloride (CuCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC10	Not Reported	T	10		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Embryotoxicity and Teratogenicity of Cu2+ and Zn2+ for Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.23(2): 111-120.
Copper	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Copper	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Copper	African clawed frog	Amphibians	Fresh	Mortality	LC50		NR	677			ug/L	NR	de Zwart and Sloof 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	African clawed frog	Amphibians	Fresh	Mortality	LC50		NR	1,700			ug/L	NR	de Zwart and Sloof 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	African clawed frog	Amphibians	Fresh	Mortality	LC50		NR	110			ug/L	NR	Linder et al. 1991. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper chloride (CuCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	22		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Embryotoxicity and Teratogenicity of Cu2+ and Zn2+ for Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.23(2): 111-120.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1080		NC	ug/L	LAB	1996. Fort, D.J., and E.L. Stover. Effect of Low-Level Copper and Pentachlorophenol Exposure on Various Early Life Stages of Xenopus laevis. In: D.A.Bengtson and D.S.Henshel (Eds.), Environmental Toxicology and Risk Assessment: Biomarkers and Risk Assessment, 5th Volume, ASTM STP 1306, Philadelphia, PA: 188-203.

Table D-10. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1250		NC	ug/L	LAB	1996. Fort, D.J., and E.L. Stover. Effect of Low-Level Copper and Pentachlorophenol Exposure on Various Early Life Stages of Xenopus laevis. In: D.A.Bengtson and D.S.Henshel (Eds.), Environmental Toxicology and Risk Assessment: Biomarkers and Risk Assessment, 5th Volume, ASTM STP 1306, Philadelphia, PA: 188-203.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	150		NC	ug/L	LAB	1996. Fort, D.J., and E.L. Stover. Effect of Low-Level Copper and Pentachlorophenol Exposure on Various Early Life Stages of Xenopus laevis. In: D.A.Bengtson and D.S.Henshel (Eds.), Environmental Toxicology and Risk Assessment: Biomarkers and Risk Assessment, 5th Volume, ASTM STP 1306, Philadelphia, PA: 188-203.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	420		NC	ug/L	LAB	1996. Fort, D.J., and E.L. Stover. Effect of Low-Level Copper and Pentachlorophenol Exposure on Various Early Life Stages of Xenopus laevis. In: D.A.Bengtson and D.S.Henshel (Eds.), Environmental Toxicology and Risk Assessment: Biomarkers and Risk Assessment, 5th Volume, ASTM STP 1306, Philadelphia, PA: 188-203.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	680*	NA	NR	ug/L	LAB	1987. De Zwart, D., and W. Slooff. Toxicity of Mixtures of Heavy Metals and Petrochemicals to Xenopus laevis. Bull. Environ. Contam. Toxicol.38: 345-351.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	890	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid copper(2+) salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	980	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Copper chloride (CuCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC90	Not Reported	T	40		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Embryotoxicity and Teratogenicity of Cu2+ and Zn2+ for Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.23(2): 111-120.
Copper	Black spined toad	Amphibians	Fresh	Mortality	LC50		NR	843			ug/L	NR	Khangarot and Ray 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Black spined toad	Amphibians	Fresh	Mortality	LC50		NR	446			ug/L	NR	Khangarot and Ray 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Black spined toad	Amphibians	Fresh	Mortality	LC50		NR	320			ug/L	NR	Khangarot and Ray 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Sulfuric acid copper(2+) salt (1:1)	Boreal Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	2005. Dwyer, F.J., F.L. Mayer, L.C. Sappington, D.R. Buckler, C.M. Bridges, I.E. Greer, D.K. Hardesty, C.E. Henke, C.G. Ingers. Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part I. Acute Toxicity of Five Chemicals. Arch. Environ. Contam. Toxicol.48(2): 143-154.
Copper	Bullfrog	Amphibians	Fresh	Mortality	LC50		NR	20			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Sulfuric acid copper(2+) salt (1:1)	Chinese Softshell Turtle	Reptiles	Fresh	Growth	LOEC	Not Reported	T	20400	NR	NR	ug/L	LAB	2008. Wu, G.S., and C.H. Huang. Estimation of Dietary Copper Requirement of Juvenile Soft-Shelled Turtles, Pelodiscus sinensis. Aquaculture280(1-4): 206-210.
Sulfuric acid copper(2+) salt (1:1)	Chinese Softshell Turtle	Reptiles	Fresh	Growth	NOEC	Not Reported	T	10900	NR	NR	ug/L	LAB	2008. Wu, G.S., and C.H. Huang. Estimation of Dietary Copper Requirement of Juvenile Soft-Shelled Turtles, Pelodiscus sinensis. Aquaculture280(1-4): 206-210.
Sulfuric acid copper(2+) salt (1:1)	Chinese Softshell Turtle	Reptiles	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2008. Wu, G.S., and C.H. Huang. Estimation of Dietary Copper Requirement of Juvenile Soft-Shelled Turtles, Pelodiscus sinensis. Aquaculture280(1-4): 206-210.
Copper	Clawed Frog	Amphibians	Fresh	Growth	LOEL	Whole Organism	T	100	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Copper	Clawed Frog	Amphibians	Fresh	Growth	LOEL	Whole Organism	T	100	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Copper	Clawed Frog	Amphibians	Fresh	Growth	LOEL	Whole Organism	T	200	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Copper	Clawed Frog	Amphibians	Fresh	Growth	LOEL	Whole Organism	T	200	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Copper chloride (CuCl2)	Clawed Frog	Amphibians	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Buchwalter, D.B., G. Linder, and L.R. Curtis. Modulation of Cupric Ion Activity by pH and Fulvic Acid as Determinants of Toxicity in Xenopus laevis Embryos and Larvae. Environ. Toxicol. Chem.15(4): 568-573.

Table D-10. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	200	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Copper	Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Copper	Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	300	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Copper	Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	400	NR	NR	ug/L	LAB	2004. Fort, D.J., R.L. Rogers, J.H. Thomas, B.O. Buzzard, A.M. Noll, and C.D. Spaulding. Comparative Sensitivity of Xenopus tropicalis and Xenopus laevis as Test Species for the FETAX Model. J. Appl. Toxicol.24(6): 443-457.
Copper chloride (CuCl2)	Clawed Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1996. Buchwalter, D.B., G. Linder, and L.R. Curtis. Modulation of Cupric Ion Activity by pH and Fulvic Acid as Determinants of Toxicity in Xenopus laevis Embryos and Larvae. Environ. Toxicol. Chem.15(4): 568-573.
Sulfuric acid copper(2+) salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1970	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid copper(2+) salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	843	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid copper(2+) salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	446	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid copper(2+) salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	320	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Copper	Cope's gray treefrog	Amphibians	Fresh	Mortality	LC50		NR	20			ug/L	NR	Gottscalk 1995. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Cope's gray treefrog	Amphibians	Fresh	Mortality	LC50		NR	40			ug/L	NR	Birge and Black 1979; Birge et al. 1979. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Eastern narrowmouth toad	Amphibians	Fresh	Mortality	LC50		NR	20			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Eastern narrowmouth toad	Amphibians	Fresh	Mortality	LC50		NR	40			ug/L	NR	Birge 1978; Birge and Black 1979; Birge et al. 1979. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Sulfuric acid copper(2+) salt (1:1)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Sulfuric acid copper(2+) salt (1:1)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Copper	Eastern tiger salamander	Amphibians	Fresh	Mortality	LC50		NR	500			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Fowler's toad	Amphibians	Fresh	Mortality	LC50		NR	26960			ug/L	NR	Birge et al. 1978; Birge and Black 1979. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Fowler's toad	Amphibians	Fresh	Mortality	LC50		NR	27000			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Sulfuric acid copper(2+) salt (1:1)	Fowler'S Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	35990	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Fowler'S Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	26960	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	5610	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	6040	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	5310	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	5740	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	5140	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	5540	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	5040	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	5380	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	155		NC	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. Protective Action of Chelating Agent EDTA on Copper and Zinc Toxicity to Frog Tadpoles. Natl. Acad. Sci. Lett.7(6): 201-203.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	45		NC	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. Protective Action of Chelating Agent EDTA on Copper and Zinc Toxicity to Frog Tadpoles. Natl. Acad. Sci. Lett.7(6): 201-203.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	42		NC	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. Protective Action of Chelating Agent EDTA on Copper and Zinc Toxicity to Frog Tadpoles. Natl. Acad. Sci. Lett.7(6): 201-203.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	39		NC	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. Protective Action of Chelating Agent EDTA on Copper and Zinc Toxicity to Frog Tadpoles. Natl. Acad. Sci. Lett.7(6): 201-203.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	39		NC	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. Protective Action of Chelating Agent EDTA on Copper and Zinc Toxicity to Frog Tadpoles. Natl. Acad. Sci. Lett.7(6): 201-203.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	155	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 4: Effects of Chelating Agent EDTA on the Acute Toxicity of Copper and Zinc on Tadpoles of the Frog Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(1): 121-125.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	450	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	45	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 4: Effects of Chelating Agent EDTA on the Acute Toxicity of Copper and Zinc on Tadpoles of the Frog Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(1): 121-125.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	42	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	42	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 4: Effects of Chelating Agent EDTA on the Acute Toxicity of Copper and Zinc on Tadpoles of the Frog Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(1): 121-125.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	39	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	39	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 4: Effects of Chelating Agent EDTA on the Acute Toxicity of Copper and Zinc on Tadpoles of the Frog Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(1): 121-125.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	39	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Sulfuric acid copper(2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	39	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 4: Effects of Chelating Agent EDTA on the Acute Toxicity of Copper and Zinc on Tadpoles of the Frog Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(1): 121-125.

Table D-10. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Copper(2+) salt	Frog And Toad Order	Amphibians	Fresh	Growth	NR	Not Reported	T	0.00002	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.
Nitric acid, Copper(2+) salt	Frog And Toad Order	Amphibians	Fresh	Mortality	NR	Not Reported	T	0.00002	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.
Copper	Indian green frog	Amphibians	Fresh	Mortality	LC50		NR	39			ug/L	NR	Khangarot et al. 1985. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Jefferson's salamander	Amphibians	Fresh	Mortality	LC50		NR	315			ug/L	NR	Horne and Dunson 1994. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Jefferson's salamander	Amphibians	Fresh	Mortality	LC50		NR	370			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper chloride (CuCl2)	Jefferson's Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	315	NA	NR	ug/L	LAB	1994. Horne, M.T., and W.A. Dunson. Exclusion of the Jefferson Salamander, Ambystoma jeffersonianum, from Some Potential Breeding Ponds in Pennsylvania: Effects of pH, Temperature, and Metals on Embryonic Development. Arch. Environ. Contam. Toxicol.27(3): 323-330.
Copper chloride	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Toxicity of Metals and Low pH to Embryos and Larvae of the Jefferson Salamander, Ambystoma jeffersonianum. Arch. Environ. Contam. Toxicol.29(1): 110-114.
Copper chloride	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Toxicity of Metals and Low pH to Embryos and Larvae of the Jefferson Salamander, Ambystoma jeffersonianum. Arch. Environ. Contam. Toxicol.29(1): 110-114.
Copper chloride (CuCl2)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	T	15	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Copper chloride (CuCl2)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	15	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Growth	LOEC	Not Reported	D	25	NR	NR	ug/L	LAB	2007. Chen, T.H., J.A. Gross, and W.H. Karasov. Adverse Effects of Chronic Exposure in Larval Northern Leopard Frogs (Rana pipiens). Environ. Toxicol. Chem.26(7): 1470-1475.
Copper	Leopard Frog	Amphibians	Fresh	Growth	LOEL	Not Reported	T	93		NC	ug/L	LAB	2004. Redick, M.S., and T.W. La Point. Effects of Sublethal Copper Exposure on Behavior and Growth of Rana pipiens Tadpoles. Bull. Environ. Contam. Toxicol.72(4): 706-710.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Growth	NOEC	Not Reported	D	5	NR	NR	ug/L	LAB	2007. Chen, T.H., J.A. Gross, and W.H. Karasov. Adverse Effects of Chronic Exposure in Larval Northern Leopard Frogs (Rana pipiens). Environ. Toxicol. Chem.26(7): 1470-1475.
Copper	Leopard Frog	Amphibians	Fresh	Growth	NOEL	Not Reported	T	71		NC	ug/L	LAB	2004. Redick, M.S., and T.W. La Point. Effects of Sublethal Copper Exposure on Behavior and Growth of Rana pipiens Tadpoles. Bull. Environ. Contam. Toxicol.72(4): 706-710.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Growth	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Lande, S.P., and S.I. Guttman. The Effects of Copper Sulfate on the Growth and Mortality Rate of Rana pipiens Tadpoles. Herpetologica29(1): 22-27.
Copper	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	67		NC	ug/L	LAB	2004. Redick, M.S., and T.W. La Point. Effects of Sublethal Copper Exposure on Behavior and Growth of Rana pipiens Tadpoles. Bull. Environ. Contam. Toxicol.72(4): 706-710.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	150	NA	NR	ug/L	LAB	1973. Lande, S.P., and S.I. Guttman. The Effects of Copper Sulfate on the Growth and Mortality Rate of Rana pipiens Tadpoles. Herpetologica29(1): 22-27.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	230		NR	ug/L	LAB	2002. Bridges, C.M., F.J. Dwyer, D.K. Hardesty, and D.W. Whites. Comparative Contaminant Toxicity: Are Amphibian Larvae More Sensitive than Fish?. Bull. Environ. Contam. Toxicol.69(4): 562-569.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	LD50	Not Reported	T	0.0016	NR	NR	%	LAB	1961. Kaplan, H.M., and L. Yoh. Toxicity of Copper for Frogs. Herpetologica17(2): 131-135.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	LOEC	Not Reported	D	100	NR	NR	ug/L	LAB	2007. Chen, T.H., J.A. Gross, and W.H. Karasov. Adverse Effects of Chronic Exposure in Larval Northern Leopard Frogs (Rana pipiens). Environ. Toxicol. Chem.26(7): 1470-1475.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	LOEC	Not Reported	D	100	NR	NR	ug/L	LAB	2007. Chen, T.H., J.A. Gross, and W.H. Karasov. Adverse Effects of Chronic Exposure in Larval Northern Leopard Frogs (Rana pipiens). Environ. Toxicol. Chem.26(7): 1470-1475.

Table D-10. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	NOEC	Not Reported	D	100	NR	NR	ug/L	LAB	2007. Chen, T.H., J.A. Gross, and W.H. Karasov. Adverse Effects of Chronic Exposure in Larval Northern Leopard Frogs (Rana pipiens). Environ. Toxicol. Chem.26(7): 1470-1475.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	NOEC	Not Reported	D	25	NR	NR	ug/L	LAB	2007. Chen, T.H., J.A. Gross, and W.H. Karasov. Adverse Effects of Chronic Exposure in Larval Northern Leopard Frogs (Rana pipiens). Environ. Toxicol. Chem.26(7): 1470-1475.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	NOEC	Not Reported	D	25	NR	NR	ug/L	LAB	2007. Chen, T.H., J.A. Gross, and W.H. Karasov. Adverse Effects of Chronic Exposure in Larval Northern Leopard Frogs (Rana pipiens). Environ. Toxicol. Chem.26(7): 1470-1475.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1973. Lande, S.P., and S.I. Guttman. The Effects of Copper Sulfate on the Growth and Mortality Rate of Rana pipiens Tadpoles. Herpetologica29(1): 22-27.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	80	NA	NR	ug/L	LAB	1973. Lande, S.P., and S.I. Guttman. The Effects of Copper Sulfate on the Growth and Mortality Rate of Rana pipiens Tadpoles. Herpetologica29(1): 22-27.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	0.1	NR	NR	%	LAB	1961. Kaplan, H.M., and L. Yoh. Toxicity of Copper for Frogs. Herpetologica17(2): 131-135.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	0.1	NR	NR	%	LAB	1961. Kaplan, H.M., and L. Yoh. Toxicity of Copper for Frogs. Herpetologica17(2): 131-135.
Copper	Leopard Frog	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	19		NC	ug/L	LAB	2004. Redick, M.S., and T.W. La Point. Effects of Sublethal Copper Exposure on Behavior and Growth of Rana pipiens Tadpoles. Bull. Environ. Contam. Toxicol.72(4): 706-710.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	0.001	NR	NR	%	LAB	1961. Kaplan, H.M., and L. Yoh. Toxicity of Copper for Frogs. Herpetologica17(2): 131-135.
Sulfuric acid copper(2+) salt (1:1)	Leopard Frog	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	0.001	NR	NR	%	LAB	1961. Kaplan, H.M., and L. Yoh. Toxicity of Copper for Frogs. Herpetologica17(2): 131-135.
Copper chloride (CuCl2)	Lowland Frog	Amphibians	Fresh	Growth	NOEL	Not Reported	T	100000		NC	ug/L	LAB	2002. Papadimitriou, E., and N.S. Loumbourdis. Exposure of the Frog Rana ridibunda to Copper: Impact on Two Biomarkers, Lipid Peroxidation, and Glutathione. Bull. Environ. Contam. Toxicol.69(6): 885-891.
Copper chloride (CuCl2)	Lowland Frog	Amphibians	Fresh	Growth	NOEL	Not Reported	D	100000	NR	NR	ug/L	LAB	2003. Papadimitriou, E.A., and N.S. Loumbourdis. Copper Kinetics and Hepatic Metallothionein Levels in the Frog Rana ridibunda, After Exposure to CuCl2. Biometals16(2): 271-277.
Copper	marbled salamander	Amphibians	Fresh	Mortality	LC50		NR	770			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Marbled salamander	Amphibians	Fresh	Mortality	LC50		NR	1630			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Sulfuric acid copper(2+) salt (1:1)	Marbled Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3590	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Marbled Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	770	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Marbled Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	770	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Sulfuric acid copper(2+) salt (1:1)	Natterjack Toad	Amphibians	Fresh	Growth	LOEC	Not Reported	T	50	NR	NR	ug/L	LAB	2009. Garcia-Munoz, E., F. Guerrero, and G. Parra. Effects of Copper Sulfate on Growth, Development, and Escape Behavior in Epidalea calamita Embryos and Larvae. Arch. Environ. Contam. Toxicol.56(3): 557-565.
Sulfuric acid copper(2+) salt (1:1)	Natterjack Toad	Amphibians	Fresh	Growth	LOEC	Not Reported	T	130	NR	NR	ug/L	LAB	2009. Garcia-Munoz, E., F. Guerrero, and G. Parra. Effects of Copper Sulfate on Growth, Development, and Escape Behavior in Epidalea calamita Embryos and Larvae. Arch. Environ. Contam. Toxicol.56(3): 557-565.
Sulfuric acid copper(2+) salt (1:1)	Natterjack Toad	Amphibians	Fresh	Growth	LOEC	Not Reported	T	200	NR	NR	ug/L	LAB	2009. Garcia-Munoz, E., F. Guerrero, and G. Parra. Effects of Copper Sulfate on Growth, Development, and Escape Behavior in Epidalea calamita Embryos and Larvae. Arch. Environ. Contam. Toxicol.56(3): 557-565.
Sulfuric acid copper(2+) salt (1:1)	Natterjack Toad	Amphibians	Fresh	Growth	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2009. Garcia-Munoz, E., F. Guerrero, and G. Parra. Effects of Copper Sulfate on Growth, Development, and Escape Behavior in Epidalea calamita Embryos and Larvae. Arch. Environ. Contam. Toxicol.56(3): 557-565.
Sulfuric acid copper(2+) salt (1:1)	Natterjack Toad	Amphibians	Fresh	Growth	NOEC	Not Reported	T	100	NR	NR	ug/L	LAB	2009. Garcia-Munoz, E., F. Guerrero, and G. Parra. Effects of Copper Sulfate on Growth, Development, and Escape Behavior in Epidalea calamita Embryos and Larvae. Arch. Environ. Contam. Toxicol.56(3): 557-565.
Sulfuric acid copper(2+) salt (1:1)	Natterjack Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	110	NR	NR	ug/L	LAB	2009. Garcia-Munoz, E., F. Guerrero, and G. Parra. Effects of Copper Sulfate on Growth, Development, and Escape Behavior in Epidalea calamita Embryos and Larvae. Arch. Environ. Contam. Toxicol.56(3): 557-565.

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Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid copper(2+) salt (1:1)	Natterjack Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	220	NR	NR	ug/L	LAB	2009. Garcia-Munoz, E., F. Guerrero, and G. Parra. Effects of Copper Sulfate on Growth, Development, and Escape Behavior in Epidalea calamita Embryos and Larvae. Arch. Environ. Contam. Toxicol.56(3): 557-565.
Sulfuric acid copper(2+) salt (1:1)	Natterjack Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	80	NR	NR	ug/L	LAB	2009. Garcia-Munoz, E., F. Guerrero, and G. Parra. Effects of Copper Sulfate on Growth, Development, and Escape Behavior in Epidalea calamita Embryos and Larvae. Arch. Environ. Contam. Toxicol.56(3): 557-565.
Copper	Northern leopard frog	Amphibians	Fresh	Mortality	LC50		NR	150			ug/L	NR	Lande and Guttman 1973. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Northern leopard frog	Amphibians	Fresh	Mortality	LC50		NR	6,368			ug/L	NR	Kaplan and Yoh 1961. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Northern leopard frog	Amphibians	Fresh	Mortality	LC50		NR	60			ug/L	NR	Lande and Guttman 1973. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Northern leopard frog	Amphibians	Fresh	Mortality	LC50		NR	76.1			ug/L	NR	Gottscalk 1995. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Northern leopard frog	Amphibians	Fresh	Mortality	LC50		NR	50			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Northern Two-Lined Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	D	1120	NR	NR	ug/L	LAB	1994. Dobbs, M.G., J.L. Farris, R.J. Reash, D.S. Cherry, and J.,Jr. Cairns. Evaluation of the Resident-Species Procedure for Developing Site-Specific Water Quality Criteria for Copper in Blaine Creek, Kentucky. Environ. Toxicol. Chem.13(6): 963-971.
Copper	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	6,040			ug/L	NR	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	5,610			ug/L	NR	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	5,310			ug/L	NR	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	5,740			ug/L	NR	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	5,140			ug/L	NR	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	5,540			ug/L	NR	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	5040			ug/L	NR	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Ornate rice frog	Amphibians	Fresh	Mortality	LC50		NR	5380			ug/L	NR	Rao and Madhyastha 1987. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Pickeral frog	Amphibians	Fresh	Mortality	LC50		NR	20			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper	Small-mouthed salamander	Amphibians	Fresh	Mortality	LC50		NR	380			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Sulfuric acid copper(2+) salt (1:1)	Southern Grey Tree Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	60	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Sulfuric acid copper(2+) salt (1:1)	Southern Grey Tree Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1979. Birge, W.J., and J.A. Black. Effects of Copper on Embryonic and Juvenile Stages of Aquatic Animals. In: J.O.Nriagu (Ed.), Copper in the Environment, J.Wiley and Sons, NY: 373-399.
Copper	Spotted salamander	Amphibians	Fresh	Mortality	LC50		NR	480			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

Table D-10. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper	Spring peeper	Amphibians	Fresh	Mortality	LC50		NR	50			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Copper chloride (CuCl2)	Spring Peeper	Amphibians	Fresh	Mortality	LOEC	Not Reported	T	5500	NR	NR	ug/L	LAB	2005. Baud, D.R., and M.L. Beck. Interactive Effects of UV-B and Copper on Spring Peeper Tadpoles (Pseudacris crucifer). Southeast. Nat.4(1): 15-22.
Copper chloride (CuCl2)	Spring Peeper	Amphibians	Fresh	Mortality	LOEC	Not Reported	T	5500	NR	NR	ug/L	LAB	2005. Baud, D.R., and M.L. Beck. Interactive Effects of UV-B and Copper on Spring Peeper Tadpoles (Pseudacris crucifer). Southeast. Nat.4(1): 15-22.
Copper chloride (CuCl2)	Spring Peeper	Amphibians	Fresh	Mortality	LOEC	Not Reported	T	5500	NR	NR	ug/L	LAB	2005. Baud, D.R., and M.L. Beck. Interactive Effects of UV-B and Copper on Spring Peeper Tadpoles (Pseudacris crucifer). Southeast. Nat.4(1): 15-22.
Copper	Streamedside salamander	Amphibians	Fresh	Mortality	LC50		NR	250			ug/L	NR	D.W. Sparling et al. 2000. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Sulfuric acid copper(2+) salt (1:1)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	0.00168		NC	%	LAB	1999. Kumar, S.. Morphological and Anatomical Alterations in Tadpole Larvae of Frog, Rana tigrina Daudin, 1802 due to Toxic Effect of Copper, Zinc and Lead. J. Adv. Zool.20(2): 90-94.
Sulfuric acid copper(2+) salt (1:1)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1996	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	693	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	470	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	389	NA	NR	ug/L	LAB	1981. Khangarot, B.S., S. Mathur, and V.S. Durve. Studies on the Acute Toxicity of Copper on Selected Freshwater Organisms. Sci. Cult.47(12): 429-431.
Sulfuric acid copper(2+) salt (1:1)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	0.003		NC	%	LAB	1999. Kumar, S.. Morphological and Anatomical Alterations in Tadpole Larvae of Frog, Rana tigrina Daudin, 1802 due to Toxic Effect of Copper, Zinc and Lead. J. Adv. Zool.20(2): 90-94.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC10	Not Reported	T	50		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC10	Not Reported	T	NR		NC	ug/L	LAB	2006. Perez-Coll, C.S., and J. Herkovits. Synergistic Effects of Copper and Butylic Ester of 2,4-Dichlorophenoxyacetic Acid (Esternon Ultra) on Amphibian Embryos. Int. J. Environ. Res. Public Health3(4): 343-347.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC10	Not Reported	T	NR		NC	ug/L	LAB	2006. Perez-Coll, C.S., and J. Herkovits. Synergistic Effects of Copper and Butylic Ester of 2,4-Dichlorophenoxyacetic Acid (Esternon Ultra) on Amphibian Embryos. Int. J. Environ. Res. Public Health3(4): 343-347.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC10	Not Reported	T	NR		NC	ug/L	LAB	2006. Perez-Coll, C.S., and J. Herkovits. Synergistic Effects of Copper and Butylic Ester of 2,4-Dichlorophenoxyacetic Acid (Esternon Ultra) on Amphibian Embryos. Int. J. Environ. Res. Public Health3(4): 343-347.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC10	Not Reported	T	NR		NC	ug/L	LAB	2006. Perez-Coll, C.S., and J. Herkovits. Synergistic Effects of Copper and Butylic Ester of 2,4-Dichlorophenoxyacetic Acid (Esternon Ultra) on Amphibian Embryos. Int. J. Environ. Res. Public Health3(4): 343-347.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC10	Not Reported	T	35	NR	NR	ug/L	LAB	2007. Herkovits, J., and C.S. Perez-Coll. Acclimation to Low Level Exposure of Copper in Bufo arenarum Embryos: Linkage of Effects to Tissue Residues. Int. J. Environ. Res. Public Health4(2): 166-172.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC10	Not Reported	T	50	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC100	Not Reported	T	210	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC100	Not Reported	T	75	NR	NR	ug/L	LAB	2007. Herkovits, J., and C.S. Perez-Coll. Acclimation to Low Level Exposure of Copper in Bufo arenarum Embryos: Linkage of Effects to Tissue Residues. Int. J. Environ. Res. Public Health4(2): 166-172.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC100	Not Reported	T	210	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC100	Not Reported	T	210	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC100	Not Reported	T	210	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	85		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR		NC	ug/L	LAB	2006. Perez-Coll, C.S., and J. Herkovits. Synergistic Effects of Copper and Butylic Ester of 2,4-Dichlorophenoxyacetic Acid (Esternon Ultra) on Amphibian Embryos. Int. J. Environ. Res. Public Health3(4): 343-347.

Table D-10. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	50	NR	NR	ug/L	LAB	2007. Herkovits, J., and C.S. Perez-Coll. Acclimation to Low Level Exposure of Copper in Bufo arenarum Embryos: Linkage of Effects to Tissue Residues. Int. J. Environ. Res. Public Health4(2): 166-172.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	85	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Sulfuric acid copper(2+) salt (1:1)	Toad	Amphibians	Fresh	Mortality	LC50*	Not Reported	T	88*	NA	NR	ug/L	LAB	1975. Nishiuchi, Y.. Toxicity of Formulated Pesticides to Some Fresh-Water Organisms. XXX. Suisan Zoshoku23(2): 88-91.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	155		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	NR		NC	ug/L	LAB	2006. Perez-Coll, C.S., and J. Herkovits. Synergistic Effects of Copper and Butylic Ester of 2,4-Dichlorophenoxyacetic Acid (Esternon Ultra) on Amphibian Embryos. Int. J. Environ. Res. Public Health3(4): 343-347.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	NR		NC	ug/L	LAB	2006. Perez-Coll, C.S., and J. Herkovits. Synergistic Effects of Copper and Butylic Ester of 2,4-Dichlorophenoxyacetic Acid (Esternon Ultra) on Amphibian Embryos. Int. J. Environ. Res. Public Health3(4): 343-347.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	NR		NC	ug/L	LAB	2006. Perez-Coll, C.S., and J. Herkovits. Synergistic Effects of Copper and Butylic Ester of 2,4-Dichlorophenoxyacetic Acid (Esternon Ultra) on Amphibian Embryos. Int. J. Environ. Res. Public Health3(4): 343-347.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	NR		NC	ug/L	LAB	2006. Perez-Coll, C.S., and J. Herkovits. Synergistic Effects of Copper and Butylic Ester of 2,4-Dichlorophenoxyacetic Acid (Esternon Ultra) on Amphibian Embryos. Int. J. Environ. Res. Public Health3(4): 343-347.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	75	NR	NR	ug/L	LAB	2007. Herkovits, J., and C.S. Perez-Coll. Acclimation to Low Level Exposure of Copper in Bufo arenarum Embryos: Linkage of Effects to Tissue Residues. Int. J. Environ. Res. Public Health4(2): 166-172.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	155	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	155	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	155	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LOEL	Not Reported	T	100		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	LOEL	Not Reported	T	100		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NOEC	Not Reported	T	20		NC	ug/L	LAB	2006. Perez-Coll, C.S., and J. Herkovits. Synergistic Effects of Copper and Butylic Ester of 2,4-Dichlorophenoxyacetic Acid (Esternon Ultra) on Amphibian Embryos. Int. J. Environ. Res. Public Health3(4): 343-347.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NOEC	Not Reported	T	30	NR	NR	ug/L	LAB	2007. Herkovits, J., and C.S. Perez-Coll. Acclimation to Low Level Exposure of Copper in Bufo arenarum Embryos: Linkage of Effects to Tissue Residues. Int. J. Environ. Res. Public Health4(2): 166-172.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.

Table D-10. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical Name	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NOEC	Not Reported	T	20	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Herkovits, J., and C.S. Perez-Coll. Acclimation to Low Level Exposure of Copper in Bufo arenarum Embryos: Linkage of Effects to Tissue Residues. Int. J. Environ. Res. Public Health4(2): 166-172.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2007. Herkovits, J., and C.S. Perez-Coll. Acclimation to Low Level Exposure of Copper in Bufo arenarum Embryos: Linkage of Effects to Tissue Residues. Int. J. Environ. Res. Public Health4(2): 166-172.
Copper chloride (CuCl2)	Toad	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	30		NC	ug/L	LAB	2006. Perez-Coll, C.S., and J. Herkovits. Synergistic Effects of Copper and Butylic Ester of 2,4-Dichlorophenoxyacetic Acid (Esternon Ultra) on Amphibian Embryos. Int. J. Environ. Res. Public Health3(4): 343-347.
Sulfuric acid copper(2+) salt (1:1)	Western Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	190	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Western Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	160	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Western Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	140	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Western Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	140	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Western Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	120	NR	NR	ug/L	LAB	1999. Dwyer, F.J., D.K. Hardesty, C.E. Henke, C.G. Ingersoll, D.W. Whites, D.R. Mount, and C.M. Bridges. Assessing Contaminant Sensitivity of Endangered and Threatened Species: Toxicant Classes. EPA 600/R-99/098, U.S.EPA, Washington, D.C.: 15 p..
Sulfuric acid copper(2+) salt (1:1)	Western Toad	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	3700	NA	NR	ug/L	LAB	1976. Porter, K.R., and D.E. Hakanson. Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo boreas). Copeia2: 327-331.
Copper chloride (CuCl2)	Wood Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	15	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Copper chloride (CuCl2)	Wood Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	15	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.

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Table D-11. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Iron (2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	17620	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Sulfuric acid, Iron (2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	19700	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Sulfuric acid, Iron (2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	22390	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Sulfuric acid, Iron (2+) salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	24910	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Iron chloride	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Iron chloride	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Iron chloride	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Toxicity of Metals and Low pH to Embryos and Larvae of the Jefferson Salamander, Ambystoma jeffersonianum. Arch. Environ. Contam. Toxicol.29(1): 110-114.
Iron chloride	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Toxicity of Metals and Low pH to Embryos and Larvae of the Jefferson Salamander, Ambystoma jeffersonianum. Arch. Environ. Contam. Toxicol.29(1): 110-114.
Iron chloride	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Toxicity of Metals and Low pH to Embryos and Larvae of the Jefferson Salamander, Ambystoma jeffersonianum. Arch. Environ. Contam. Toxicol.29(1): 110-114.
Sulfuric acid, Iron (2+) salt (1:1)	Western Toad	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	30000	NA	NR	ug/L	LAB	1976. Porter, K.R., and D.E. Hakanson. Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo boreas). Copeia2: 327-331.
Iron chloride	Wood Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Iron chloride	Wood Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	20	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.

Table D-12. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead	American Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Steele, C.W., S. Strickler-Shaw, and D.H. Taylor. Failure of Bufo americanus Tadpoles to Avoid Lead-Enriched Water. J. Herpetol.25(2): 241-243.
Nitric acid, Lead (2+) salt	Bullfrog	Amphibians	Fresh	Growth	NOEC	Not Reported	T	776	NR	NR	ug/L	LAB	1999. Rice, T.M., B.J. Blackstone, W.L. Nixdorf, and D.H. Taylor. Exposure to Lead Induces Hypoxia-Like Responses in Bullfrog Larvae (Rana catesbeiana). Environ. Toxicol. Chem.18(10): 2283-2288.
Nitric acid, Lead (2+) salt	Bullfrog	Amphibians	Fresh	Growth	NOEC	Not Reported	T	786	NR	NR	ug/L	LAB	1999. Rice, T.M., B.J. Blackstone, W.L. Nixdorf, and D.H. Taylor. Exposure to Lead Induces Hypoxia-Like Responses in Bullfrog Larvae (Rana catesbeiana). Environ. Toxicol. Chem.18(10): 2283-2288.
Lead	Common toad	Amphibians	Fresh	Mortality	LC50		NR	470			ug/L	NR	. . . .
Lead	Eastern narrowmouth toad	Amphibians	Fresh	Mortality	LC50		NR	40			ug/L	NR	. . . .
Lead	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Lead chloride (PbCl2)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	40	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Nitric acid, Lead (2+) salt	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	33280	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Nitric acid, Lead (2+) salt	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	41310	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Nitric acid, Lead (2+) salt	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	66650	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Nitric acid, Lead (2+) salt	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	100000	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Lead	Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Lead	Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Lead	Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Lead	Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Lead	Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Nitric acid, Lead (2+) salt	Frog And Toad Order	Amphibians	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.
Nitric acid, Lead (2+) salt	Frog And Toad Order	Amphibians	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.
Nitric acid, Lead (2+) salt	Frog And Toad Order	Amphibians	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.
Nitric acid, Lead (2+) salt	Frog And Toad Order	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.
Nitric acid, Lead (2+) salt	Frog And Toad Order	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.
Nitric acid, Lead (2+) salt	Frog And Toad Order	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.

Table D-12. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, Lead (2+) salt	Frog And Toad Order	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.
Nitric acid, Lead (2+) salt	Green Frog	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	1000	NR	NR	ug/L	LAB	1990. Taylor, D.H., C.W. Steele, and S. Strickler-Shaw. Responses of Green Frog (Rana clamitans) Tadpoles to Lead-Polluted Water. Environ. Toxicol. Chem.9(1): 87-93.
Lead	Indian green frog	Amphibians	Fresh	Mortality	LC50		NR	33280			ug/L	NR	. . . .
Lead chloride (PbCl2)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Lead chloride (PbCl2)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Lead chloride (PbCl2)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Toxicity of Metals and Low pH to Embryos and Larvae of the Jefferson Salamander, Ambystoma jeffersonianum. Arch. Environ. Contam. Toxicol.29(1): 110-114.
Lead chloride (PbCl2)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Toxicity of Metals and Low pH to Embryos and Larvae of the Jefferson Salamander, Ambystoma jeffersonianum. Arch. Environ. Contam. Toxicol.29(1): 110-114.
Lead chloride (PbCl2)	Marbled Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1460	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Lead	Marbled salamander	Amphibians	Fresh	Mortality	LC50		NR	1460			ug/L	NR	. . . .
Lead	Northern leopard frog	Amphibians	Fresh	Mortality	LC50		NR	105000			ug/L	NR	. . . .
Lead	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	1687500			ug/L	NR	. . . .
Lead	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	1895800			ug/L	NR	. . . .
Lead	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	1583300			ug/L	NR	. . . .
Lead	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	1770800			ug/L	NR	. . . .
Lead	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	1541700			ug/L	NR	. . . .
Lead	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	1625000			ug/L	NR	. . . .
Lead	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	1540700			ug/L	NR	. . . .
Lead	Skipper frog	Amphibians	Fresh	Mortality	LC50		NR	1632300			ug/L	NR	. . . .
Nitric acid, Lead (2+) salt	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1540700	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Nitric acid, Lead (2+) salt	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1541700	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Nitric acid, Lead (2+) salt	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1583300	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Nitric acid, Lead (2+) salt	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1625000	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Nitric acid, Lead (2+) salt	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1632300	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Nitric acid, Lead (2+) salt	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1687500	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Nitric acid, Lead (2+) salt	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1770800	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Nitric acid, Lead (2+) salt	Skipping Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1895800	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Nitric acid, Lead (2+) salt	Spotted Frog	Amphibians	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Nitric acid, Lead (2+) salt	Spotted Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Nitric acid, Lead (2+) salt	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	0.072		NC	%	LAB	1999. Kumar, S.. Morphological and Anatomical Alterations in Tadpole Larvae of Frog, Rana tigrina Daudin, 1802 due to Toxic Effect of Copper, Zinc and Lead. J. Adv. Zool.20(2): 90-94.
Nitric acid, Lead (2+) salt	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	0.12		NC	%	LAB	1999. Kumar, S.. Morphological and Anatomical Alterations in Tadpole Larvae of Frog, Rana tigrina Daudin, 1802 due to Toxic Effect of Copper, Zinc and Lead. J. Adv. Zool.20(2): 90-94.
Nitric acid, Lead (2+) salt	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Perez-Coll, C.S., J. Herkovits, and A. Salibian. Embryotoxicity of Lead on Bufo arenarum. Bull. Environ. Contam. Toxicol.41(2): 247-252.

Table D-12. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Lead	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	1000	NA	NR	ug/L	LAB	1990. Perez-Coll, C.S., and J. Herkovits. Stage Dependent Susceptibility to Lead in Bufo arenarum Embryos. Environ. Pollut.63(3): 239-245.
Lead	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Herkovits, J., and C.S. Perez-Coll. Antagonism and Synergism Between Lead and Zinc in Amphibian Larvae. Environ. Pollut.69: 217-221.
Lead	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Lead	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Lead	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Lead	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Lead	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2005. Ezemonye, L.I.N., and A. Enuneku. Evaluation of Acute Toxicity of Cadmium and Lead to Amphibian Tadpoles (Toad: Bufo maculatus and Frog: Ptychadena bibroni). J. Aquat. Sci.20(1): 33-38.
Lead chloride (PbCl2)	Wood Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	Perez-Coll et al. 1988. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Lead chloride (PbCl2)	Wood Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	10	NA	NR	ug/L	LAB	Mudgall and Patil 1988. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

Table D-13. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Manganese	rn Narrow-Mouthed	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1420	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Manganese chloride (MnCl2)	rn Narrow-Mouthed	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1420	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Sulfuric acid, Manganese(3+) salt (3:2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	16620	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Manganese(3+) salt (3:2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	17560	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Manganese(3+) salt (3:2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	16030	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Manganese(3+) salt (3:2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	16520	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Manganese(3+) salt (3:2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	15570	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Manganese(3+) salt (3:2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	15710	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Manganese(3+) salt (3:2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	14330	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Manganese(3+) salt (3:2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	14840	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.

Table D-14. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Mercury chloride (HgCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	100	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Mercury chloride (HgCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	70*	NA	NR	ug/L	LAB	1987. De Zwart, D., and W. Slooff. Toxicity of Mixtures of Heavy Metals and Petrochemicals to Xenopus laevis. Bull. Environ. Contam. Toxicol.38: 345-351.
Mercury chloride (HgCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	70*	NA	NR	ug/L	LAB	1980. Slooff, W., and R. Baerselman. Comparison of the Usefulness of the Mexican Axolotl (Ambystoma mexicanum) and the Clawed Toad (Xenopus laevis) in Toxicological Bioassays. Bull. Environ. Contam. Toxicol.24(3): 439-443.
Mercury chloride (HgCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	0.16	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury	African clawed frog	Amphibians	Fresh	Mortality	LC50			Log 0.46	NA	NR	ug/L	NR	. . . .
Mercury	African clawed frog	Amphibians	Fresh	Mortality	LC50			100	NA	NR	ug/L	NR	. . . .
Mercury	African clawed frog	Amphibians	Fresh	Mortality	LC50			74	NA	NR	ug/L	NR	. . . .
Mercury	African clawed frog	Amphibians	Fresh	Mortality	LC50			100	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson. The Effects of Mercury on Reproduction of Fish and Amphibians. In: O.Nriagu (Ed.), The Biogeochemistry of Mercury in the Environment, Chapter 23, Elsevier/North-Holland Biomedical Press: 629-655.
Mercury	Asian bullfrog	Amphibians	Fresh	Mortality	LC50			19020	NA	NR	ug/L	NR	. . . .
Mercury	Asian bullfrog	Amphibians	Fresh	Mortality	LC50			18300	NA	NR	ug/L	NR	. . . .
Mercury	Asian bullfrog	Amphibians	Fresh	Mortality	LC50			18040	NA	NR	ug/L	NR	. . . .
Mercury	Asian bullfrog	Amphibians	Fresh	Mortality	LC50			18950	NA	NR	ug/L	NR	. . . .
Mercury	Asian bullfrog	Amphibians	Fresh	Mortality	LC50			18500	NA	NR	ug/L	NR	. . . .
Mercury	Asian bullfrog	Amphibians	Fresh	Mortality	LC50			16740	NA	NR	ug/L	NR	. . . .
Mercury	Asian bullfrog	Amphibians	Fresh	Mortality	LC50			18300	NA	NR	ug/L	NR	. . . .
Mercury	Asian bullfrog	Amphibians	Fresh	Mortality	LC50			16100	NA	NR	ug/L	NR	. . . .
Mercury	Axolotl	Amphibians	Fresh	Mortality	LC50			Log 0.17	NA	NR	ug/L	NR	. . . .
Mercury	Axolotl	Amphibians	Fresh	Mortality	LC50			259	NA	NR	ug/L	NR	. . . .
Mercury	Axolotl	Amphibians	Fresh	Mortality	LC50			296	NA	NR	ug/L	NR	. . . .
Mercury	Axolotl	Amphibians	Fresh	Mortality	LC50			400	NA	NR	ug/L	NR	. . . .
Mercury	Axolotl	Amphibians	Fresh	Mortality	LC50			350	NA	NR	ug/L	NR	. . . .
Mercury	Baird's spotted toad	Amphibians	Fresh	Mortality	LC50			36.8	NA	NR	ug/L	NR	. . . .
Mercury	Barking treefrog	Amphibians	Fresh	Mortality	LC50			2.5	NA	NR	ug/L	NR	. . . .
Mercury	Black spined toad	Amphibians	Fresh	Mortality	LC50			52.8	NA	NR	ug/L	NR	. . . .
Mercury	Black spined toad	Amphibians	Fresh	Mortality	LC50			45.6	NA	NR	ug/L	NR	. . . .
Mercury	Black spined toad	Amphibians	Fresh	Mortality	LC50			43.6	NA	NR	ug/L	NR	. . . .
Mercury	Black spined toad	Amphibians	Fresh	Mortality	LC50			44	NA	NR	ug/L	NR	. . . .
Mercury	Black spined toad	Amphibians	Fresh	Mortality	LC50			56	NA	NR	ug/L	NR	. . . .
Mercury	Black spined toad	Amphibians	Fresh	Mortality	LC50			185	NA	NR	ug/L	NR	. . . .
Mercury	*Bufo japonicus*	Amphibians	Fresh	Mortality	LC50			120	NA	NR	ug/L	NR	. . . .
Mercury	Bullfrog	Amphibians	Fresh	Mortality	LC50			1000	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	6.98	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Mercury chloride (HgCl2)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	355*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	52.8	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Mercury chloride (HgCl2)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	240*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	45.6	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.

Table D-14. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	185*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	43.6	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Mercury	Cope's gray treefrog	Amphibians	Fresh	Mortality	LC50			2.4	NA	NR	ug/L	NR	. . . .
Mercury	Eastern green toad	Amphibians	Fresh	Mortality	LC50			40	NA	NR	ug/L	NR	. . . .
Mercury	Eastern narrowmouth toad	Amphibians	Fresh	Mortality	LC50			1	NA	NR	ug/L	NR	. . . .
Mercury	Eastern narrowmouth toad	Amphibians	Fresh	Mortality	LC50			1.3	NA	NR	ug/L	NR	. . . .
Mercury	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Mercury chloride (HgCl2)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1.3	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Mercury chloride (HgCl2)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	7	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	0.1	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury	Fowler's toad	Amphibians	Fresh	Mortality	LC50			65.9	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	Fowler'S Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	65.9	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury	Fowler's toad	Amphibians	Fresh	Mortality	LC50			25	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	Fowler'S Toad	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Fowler'S Toad	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	7	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2040	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2410	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1680	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2070	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1190	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1740	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1120	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1430	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	126.4*	NA	NR	ug/L	LAB	1980. Ghate, H.V., and L. Mulherkar. Effect of Mercuric Chloride on Embryonic Development of the Frog Microhyla ornata. Indian J. Exp. Biol.18(10): 1094-1096.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	87.82*	NA	NR	ug/L	LAB	1980. Ghate, H.V., and L. Mulherkar. Effect of Mercuric Chloride on Embryonic Development of the Frog Microhyla ornata. Indian J. Exp. Biol.18(10): 1094-1096.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	480*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	330*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.

Table D-14. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	200*	NA	NR	ug/L	LAB	1988. Paulose, P.V.. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol.9(2): 203-206.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	762	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	121	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	68	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Mercury chloride (HgCl2)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	51	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Mercury	Gray treefrog	Amphibians	Fresh	Mortality	LC50			2.6	NA	NR	ug/L	NR	. . . .
Mercury	*Hyla chysocephala*	Amphibians	Fresh	Mortality	LC50			5	NA	NR	ug/L	NR	. . . .
Mercury	Indian green frog	Amphibians	Fresh	Mortality	LC50			51	NA	NR	ug/L	NR	. . . .
Mercury	Indian green frog	Amphibians	Fresh	Mortality	LC50			680	NA	NR	ug/L	NR	. . . .
Mercury	Indian green frog	Amphibians	Fresh	Mortality	LC50			59.9	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	7.3	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Marbled Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Mercury	Marbled salamander	Amphibians	Fresh	Mortality	LC50			107.5	NA	NR	ug/L	NR	. . . .
Mercury	Marbled salamander	Amphibians	Fresh	Mortality	LC50			110	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	Mexican Axolotl	Amphibians	Fresh	Mortality	LC50	Not Reported	T	560	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Mercury chloride (HgCl2)	Mexican Axolotl	Amphibians	Fresh	Mortality	LC50	Not Reported	T	350	NR	NR	ug/L	LAB	1982. Slooff, W.. A Comparative Study on the Short-Term Effects of 15 Chemicals on Fresh Water Organisms of Different Tropic Levels. Natl.Tech.Inf.Serv., Springfield, VA: 25 p..
Mercury chloride (HgCl2)	Mexican Axolotl	Amphibians	Fresh	Mortality	LC50	Not Reported	T	300*	NA	NR	ug/L	LAB	1980. Slooff, W., and R. Baerselman. Comparison of the Usefulness of the Mexican Axolotl (Ambystoma mexicanum) and the Clawed Toad (Xenopus laevis) in Toxicological Bioassays. Bull. Environ. Contam. Toxicol.24(3): 439-443.
Mercury	Northern cricket frog	Amphibians	Fresh	Mortality	LC50			10.4	NA	NR	ug/L	NR	. . . .
Mercury	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			7.3	NA	NR	ug/L	NR	. . . .
Mercury	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			1000	NA	NR	ug/L	NR	. . . .
Mercury	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			10	NA	NR	ug/L	NR	. . . .
Mercury	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			7.3	NA	NR	ug/L	NR	. . . .
Mercury	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			10000	NA	NR	ug/L	NR	. . . .
Mercury	Ornate rice frog	Amphibians	Fresh	Mortality	LC50			2040	NA	NR	ug/L	NR	. . . .
Mercury	Ornate rice frog	Amphibians	Fresh	Mortality	LC50			2410	NA	NR	ug/L	NR	. . . .
Mercury	Ornate rice frog	Amphibians	Fresh	Mortality	LC50			1680	NA	NR	ug/L	NR	. . . .
Mercury	Ornate rice frog	Amphibians	Fresh	Mortality	LC50			2070	NA	NR	ug/L	NR	. . . .
Mercury	Ornate rice frog	Amphibians	Fresh	Mortality	LC50			170.4	NA	NR	ug/L	NR	. . . .
Mercury	Ornate rice frog	Amphibians	Fresh	Mortality	LC50			126	NA	NR	ug/L	NR	. . . .
Mercury	Ornate rice frog	Amphibians	Fresh	Mortality	LC50			88	NA	NR	ug/L	NR	. . . .
Mercury	Ornate rice frog	Amphibians	Fresh	Mortality	LC50			118.4	NA	NR	ug/L	NR	. . . .
Mercury	Ornate rice frog	Amphibians	Fresh	Mortality	LC50			1120	NA	NR	ug/L	NR	. . . .
Mercury	Ornate rice frog	Amphibians	Fresh	Mortality	LC50			1430	NA	NR	ug/L	NR	. . . .

Table D-14. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Pig Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	67.2	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury	Pig frog	Amphibians	Fresh	Mortality	LC50			75	NA	NR	ug/L	NR	. . . .
Mercury	Pig frog	Amphibians	Fresh	Mortality	LC50			67.2	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	Pig Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	250	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Pig Frog	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	1	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury	*Rana breviceps*	Amphibians	Fresh	Mortality	LC50			60	NA	NR	ug/L	NR	. . . .
Mercury	*Rana breviceps*	Amphibians	Fresh	Mortality	LC50			207	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	Red-Spotted Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	36.8	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury	Red-spotted toad	Amphibians	Fresh	Mortality	LC50			25	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	Red-Spotted Toad	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	100	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Red-Spotted Toad	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	7	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	River Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1430	NA	NR	ug/L	LAB	1993. Punzo, F.. Effect of Mercuric Chloride on Fertilization and Larval Development in the River Frog, Rana heckscheri (Wright) (Anura: Ranidae). Bull. Environ. Contam. Toxicol.51(4): 575-581.
Mercury chloride (HgCl2)	River Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	680	NA	NR	ug/L	LAB	1993. Punzo, F.. Effect of Mercuric Chloride on Fertilization and Larval Development in the River Frog, Rana heckscheri (Wright) (Anura: Ranidae). Bull. Environ. Contam. Toxicol.51(4): 575-581.
Mercury	River frog	Amphibians	Fresh	Mortality	LC50			502	NA	NR	ug/L	NR	. . . .
Mercury	River frog	Amphibians	Fresh	Mortality	LC50			502	NA	NR	ug/L	NR	. . . .
Mercury	River frog	Amphibians	Fresh	Mortality	LC50			3252	NA	NR	ug/L	NR	. . . .
Mercury	River frog	Amphibians	Fresh	Mortality	LC50			75	NA	NR	ug/L	NR	. . . .
Mercury	River frog	Amphibians	Fresh	Mortality	LC50			65.9	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	River Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	5000	NA	NR	ug/L	LAB	1993. Punzo, F.. Effect of Mercuric Chloride on Fertilization and Larval Development in the River Frog, Rana heckscheri (Wright) (Anura: Ranidae). Bull. Environ. Contam. Toxicol.51(4): 575-581.
Mercury chloride (HgCl2)	River Frog	Amphibians	Fresh	Reproduction	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1993. Punzo, F.. Effect of Mercuric Chloride on Fertilization and Larval Development in the River Frog, Rana heckscheri (Wright) (Anura: Ranidae). Bull. Environ. Contam. Toxicol.51(4): 575-581.
Mercury	Skipper frog	Amphibians	Fresh	Mortality	LC50			3830	NA	NR	ug/L	NR	. . . .
Mercury	Skipper frog	Amphibians	Fresh	Mortality	LC50			3350	NA	NR	ug/L	NR	. . . .
Mercury	Skipper frog	Amphibians	Fresh	Mortality	LC50			3330	NA	NR	ug/L	NR	. . . .
Mercury	Skipper frog	Amphibians	Fresh	Mortality	LC50			3050	NA	NR	ug/L	NR	. . . .
Mercury	Skipper frog	Amphibians	Fresh	Mortality	LC50			3160	NA	NR	ug/L	NR	. . . .
Mercury	Skipper frog	Amphibians	Fresh	Mortality	LC50			2900	NA	NR	ug/L	NR	. . . .
Mercury	Skipper frog	Amphibians	Fresh	Mortality	LC50			3160	NA	NR	ug/L	NR	. . . .
Mercury	Skipper frog	Amphibians	Fresh	Mortality	LC50			2500	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	Southern Grey Tree Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2.4	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Southern Grey Tree Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	10	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury chloride (HgCl2)	Southern Grey Tree Frog	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	0.1	NR	NR	ug/L	LAB	1983. Birge, W.J., J.A. Black, A.G. Westerman, and B.A. Ramey. Fish and Amphibian Embryos - a Model System for Evaluating Teratogenicity. Fundam. Appl. Toxicol.3: 237-242.
Mercury	Spring Peeper	Amphibians	Fresh	Mortality	LC50			2.8	NA	NR	ug/L	NR	. . . .
Mercury	Squirrel treefrog	Amphibians	Fresh	Mortality	LC50			5	NA	NR	ug/L	NR	. . . .
Mercury	Squirrel treefrog	Amphibians	Fresh	Mortality	LC50			2.4	NA	NR	ug/L	NR	. . . .
Mercury chloride (HgCl2)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	18300	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Mercury chloride (HgCl2)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	19020	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.

Table D-14. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Mercury chloride (HgCl2)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	18040	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Mercury chloride (HgCl2)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	18950	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Mercury chloride (HgCl2)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	16740	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Mercury chloride (HgCl2)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	18500	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Mercury chloride (HgCl2)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	16100	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.
Mercury chloride (HgCl2)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	18300	NR	NR	ug/L	LAB	1988. Mudgall, C.F., and S.S. Patil. Toxicity of Lead and Mercury to Frogs Rana cyanophlyctis and Rana tigerina. Environ. Ecol.6(2): 506-507.

Table D-15. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	African Clawed Frog	Amphibians	Fresh	Growth	EC50	Not Reported	T	2.5	NA	NR	umol/L	LAB	1992. Sunderman, F.WilliamJr. Embryotoxicity and Teratogenicity of Ni2+ and Co2+ in Xenopus laevis. Science and Technology Letters: 467-474.
Nickel chloride (NiCl2)	African Clawed Frog	Amphibians	Fresh	Growth	LOEC	Not Reported	T	5.6	NA	NR	umol/L	LAB	1992. Sunderman, F.WilliamJr. Embryotoxicity and Teratogenicity of Ni2+ and Co2+ in Xenopus laevis. Science and Technology Letters: 467-474.
Nickel chloride (NiCl2)	African Clawed Frog	Amphibians	Fresh	Growth	NR	Eye	T	NR	NR	NR	umol/L	LAB	1993. Hauptman, O., D.M. Albert, M.C. Plowman, S.M. Hopfer, and F.W. Sunderman. Ocular Malformations of Xenopus laevis Exposed to Nickel During Embryogenesis. Ann. Clin. Lab. Sci.23(6): 397-406.
Nickel chloride (NiCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	365	NA	NR	umol/L	LAB	1992. Sunderman, F.WilliamJr. Embryotoxicity and Teratogenicity of Ni2+ and Co2+ in Xenopus laevis. Science and Technology Letters: 467-474.
Nickel	African clawed frog	Amphibians	Fresh	Mortality	LC50			300	NA	NR	ug/L	NR	. . . .
Nickel	African clawed frog	Amphibians	Fresh	Mortality	LC50			1800	NA	NR	ug/L	NR	. . . .
Nickel	African clawed frog	Amphibians	Fresh	Mortality	LC50			1700	NA	NR	ug/L	NR	. . . .
Nickel	African clawed frog	Amphibians	Fresh	Mortality	LC50			21429	NA	NR	ug/L	NR	. . . .
Nickel	Black spined toad	Amphibians	Fresh	Mortality	LC50			53210	NA	NR	ug/L	NR	. . . .
Nickel	Black spined toad	Amphibians	Fresh	Mortality	LC50			34300	NA	NR	ug/L	NR	. . . .
Nickel	Black spined toad	Amphibians	Fresh	Mortality	LC50			25320	NA	NR	ug/L	NR	. . . .
Sulfuric acid, Nickel(2+)salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	61410	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	53210	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	34300	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid, Nickel(2+)salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	25320	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Nickel	Eastern narrowmouth toad	Amphibians	Fresh	Mortality	LC50			50	NA	NR	ug/L	NR	. . . .
Nickel	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Nickel chloride (NiCl2)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	50	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Nickel	Fowler's toad	Amphibians	Fresh	Mortality	LC50			11030	NA	NR	ug/L	NR	. . . .
Nickel	Indian rice frog	Amphibians	Fresh	Mortality	LC50			261	NA	NR	ug/L	NR	. . . .
Nickel chloride (NiCl2)	Marbled Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	420	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Nickel	Marbled salamander	Amphibians	Fresh	Mortality	LC50			420	NA	NR	ug/L	NR	. . . .
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	LC10	Not Reported	T	21280		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	23430		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	26250	NR	NR	ug/L	LAB	2000. Herkovits, J., C.S. Perez-Coll, and F.D. Herkovits. Evaluation of Nickel-Zinc Interactions by Means of Bioassays with Amphibian Embryos. Ecotoxicol. Environ. Saf.45(3): 266-273.
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	12370	NR	NR	ug/L	LAB	2000. Herkovits, J., C.S. Perez-Coll, and F.D. Herkovits. Evaluation of Nickel-Zinc Interactions by Means of Bioassays with Amphibian Embryos. Ecotoxicol. Environ. Saf.45(3): 266-273.
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	6580	NR	NR	ug/L	LAB	2000. Herkovits, J., C.S. Perez-Coll, and F.D. Herkovits. Evaluation of Nickel-Zinc Interactions by Means of Bioassays with Amphibian Embryos. Ecotoxicol. Environ. Saf.45(3): 266-273.

Table D-15. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3620	NR	NR	ug/L	LAB	2000. Herkovits, J., C.S. Perez-Coll, and F.D. Herkovits. Evaluation of Nickel-Zinc Interactions by Means of Bioassays with Amphibian Embryos. Ecotoxicol. Environ. Saf.45(3): 266-273.
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2840	NR	NR	ug/L	LAB	2000. Herkovits, J., C.S. Perez-Coll, and F.D. Herkovits. Evaluation of Nickel-Zinc Interactions by Means of Bioassays with Amphibian Embryos. Ecotoxicol. Environ. Saf.45(3): 266-273.
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2160	NR	NR	ug/L	LAB	2000. Herkovits, J., C.S. Perez-Coll, and F.D. Herkovits. Evaluation of Nickel-Zinc Interactions by Means of Bioassays with Amphibian Embryos. Ecotoxicol. Environ. Saf.45(3): 266-273.
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	1790	NR	NR	ug/L	LAB	2000. Herkovits, J., C.S. Perez-Coll, and F.D. Herkovits. Evaluation of Nickel-Zinc Interactions by Means of Bioassays with Amphibian Embryos. Ecotoxicol. Environ. Saf.45(3): 266-273.
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	25800		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	NOEL	Not Reported	T	20000		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	NOEL	Not Reported	T	20000		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Nickel chloride (NiCl2)	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	2000. Herkovits, J., C.S. Perez-Coll, and F.D. Herkovits. Evaluation of Nickel-Zinc Interactions by Means of Bioassays with Amphibian Embryos. Ecotoxicol. Environ. Saf.45(3): 266-273.

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Table D-16. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Pyrene	African clawed frog	Amphibians	NR	Mortality	LC50		NR	140	NR	NR	ug/L	NR	. . . .
Naphthalene	African clawed frog	Amphibians	NR	Mortality	LC50		NR	2100	NR	NR	ug/L	NR	1996. Hatch and Burton. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Fluoranthene	Northern leopard frog	Amphibians	NR	Mortality	LC15		NR	125	NR	NR	ug/L	NR	1996. Hatch and Burton. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Fluoranthene	Northern leopard frog	Amphibians	NR	Mortality	LC20		NR	625	NR	NR	ug/L	NR	1996. Hatch and Burton. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Anthracene with UV	Northern leopard frog	Amphibians	NR	Mortality	LC50		NR	65	NR	NR	ug/L	NR	1996. Hatch and Burton. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Fluoranthene	Northern leopard frog	Amphibians	NR	Mortality	LC50		NR	90	NR	NR	ug/L	NR	1984. Kagan et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Anthracene with UV	Northern leopard frog	Amphibians	NR	Mortality	LC50		NR	25	NR	NR	ug/L	NR	1985. Kagan et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Fluoranthene	Northern leopard frog	Amphibians	NR	Mortality	LC50		NR	366	NR	NR	ug/L	NR	1984. Kagan et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Fluoranthene	Northern leopard frog	Amphibians	NR	Mortality	LC80		NR	625	NR	NR	ug/L	NR	1984. Kagan et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Fluoranthene	Spotted salamander	Amphibians	NR	Mortality	LC10		NR	125	NR	NR	ug/L	NR	1982. Edisten and Bantle. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Fluoranthene	Spotted salamander	Amphibians	NR	Mortality	LC100		NR	625	NR	NR	ug/L	NR	1998. Hatch, A.C. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Fluoranthene	Spotted salamander	Amphibians	NR	Mortality	LC5		NR	1250	NR	NR	ug/L	NR	1998. Hatch, A.C. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Fluoranthene	Spotted salamander	Amphibians	NR	Mortality	LC50		NR	247	NR	NR	ug/L	NR	1996. Hatch and Burton. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

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Table D-17. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
PCB 1254	American Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	2.02	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1254	American Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	10.32	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1254	American Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	2.02	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1242	American Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	2.71	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1242	American Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	50.17	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1242	American Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	2.71	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
Capacitor 21	Common toad	Amphibians	Fresh	Mortality	LC50			9970			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Aroclor 1016	Common toad	Amphibians	Fresh	Mortality	LC50			7160			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Aroclor 1242	Common toad	Amphibians	Fresh	Mortality	LC50			2710			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Aroclor 1254	Common toad	Amphibians	Fresh	Mortality	LC50			2020			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
PCB 1254	Fowler'S Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	3.74	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1254	Fowler'S Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	38.18	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1254	Fowler'S Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	3.74	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1242	Fowler'S Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	12.09	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1242	Fowler'S Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	131.1	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1242	Fowler'S Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	F	12.09	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
Capacitor 21	Fowler's toad	Amphibians	Fresh	Mortality	LC50			28000			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Aroclor 1016	Fowler's toad	Amphibians	Fresh	Mortality	LC50			27700			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Aroclor 1242	Fowler's toad	Amphibians	Fresh	Mortality	LC50			12100			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Aroclor 1254	Fowler's toad	Amphibians	Fresh	Mortality	LC50			3740			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
--	Fowler's toad	Amphibians	Fresh	Mortality	LC50			2950			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
--	Fowler's toad	Amphibians	Fresh	Mortality	LC50			3740			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

Table D-17. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
--	Fowler's toad	Amphibians	Fresh	Mortality	LC50			3880			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
--	Fowler's toad	Amphibians	Fresh	Mortality	LC50			7680			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
1,1'-Biphenyl, Chloro derivs.	Frog	Amphibians	Fresh	Growth	NR	Not Reported	F	NR	NA	NR	ug/L	LAB	1973. Hasegawa, M.. Studies on the Wild Animals As "Contamination-Index". (Part 1) The Effects of PCB on Frog Tadpoles (Rana chensinensis). Rep.Hokkaido Inst.Public Health /Hokkaidoritsu Eisei Kenkynsho-ho23: 6-9.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Green Frog	Amphibians	Fresh	Growth	NR	Not Reported	F	NR	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Green Frog	Amphibians	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Green Frog	Amphibians	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Green Frog	Amphibians	Fresh	Mortality	NR	Egg	F	NR	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Green Frog	Amphibians	Fresh	Mortality	NR	Not Reported	F	50	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Green Frog	Amphibians	Fresh	Mortality	NR	Not Reported	F	5	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Leopard Frog	Amphibians	Fresh	Growth	NR	Whole Organism	F	5	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Leopard Frog	Amphibians	Fresh	Growth	NR	Whole Organism	F	50	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Leopard Frog	Amphibians	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Leopard Frog	Amphibians	Fresh	Growth	NR	Whole Organism	F	NR	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
PCB 1254	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	F	1.03	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1254	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	F	3.51	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1254	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	F	1.03	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1242	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	F	2.13	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1242	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	F	7.81	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
PCB 1242	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	F	2.13	NA	NR	ug/L	LAB	1978. Birge, W.J., J.A. Black, and A.G. Westerman. Effects of Polychlorinated Biphenyl Compounds and Proposed PCB-Replacement Products on Embryo-Larval Stages of Fish and Amphibians. Res.Rep.No.118, Kentucky Water Resour.Res.Inst., Univ.of Kentucky, Lexington,
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Leopard Frog	Amphibians	Fresh	Mortality	NR	Egg	F	NR	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Leopard Frog	Amphibians	Fresh	Mortality	NR	Not Reported	F	5	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.
3,3',4,4',5-Pentachloro-1,1'-biphenyl	Leopard Frog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	F	50	NR	NR	ug/L	LAB	1999. Rosenshield, M.L., M.B. Jofre, and W.H. Karasov. Effects of Polychlorinated Biphenyl 126 on Green Frog (Rana clamitans) and Leopard Frog (Rana pipiens) Hatching Success, Development, and Metamorphosis. Environ. Toxicol. Chem.18(11): 2478-2486.

Table D-17. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Capacitor 21	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			2870			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Aroclor 1016	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			6190			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Aroclor 1242	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			2130			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Aroclor 1254	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			1030			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
--	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			3630			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
--	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			4440			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
--	Northern leopard frog	Amphibians	Fresh	Mortality	LC50			6950			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.
Aroclor 1254	Spanish ribbed newt	Amphibians	Fresh	Mortality	LC50			50			ug/L	NR	2000. Sparling et al. As cited in Naval Facilities Engineering Command. Technical Report TR-2245-ENV. Development of a standardized approach for assessing potential risks to amphibians exposed to sediment and hyrdic soils.

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Table D-18. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Selenium	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	90	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.

Table D-19. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Nitric acid, silver (1+) salt	Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	20	NR	NR	ug/L	LAB	1996. Birge, W.J., and J.A. Zuiderveen. The Comparative Toxicity of Silver to Aquatic Biota. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 79-87.
Nitric acid, silver (1+) salt	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	12.7	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Nitric acid, silver (1+) salt	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	7.3	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Nitric acid, silver (1+) salt	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	6.2	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Nitric acid, silver (1+) salt	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	4.1	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Silver	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Nitric acid, silver (1+) salt	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Birge, W.J., and J.A. Zuiderveen. The Comparative Toxicity of Silver to Aquatic Biota. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 79-87.
Nitric acid, silver (1+) salt	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Nitric acid, silver (1+) salt	Fowler'S Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	230	NR	NR	ug/L	LAB	1996. Birge, W.J., and J.A. Zuiderveen. The Comparative Toxicity of Silver to Aquatic Biota. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 79-87.
Nitric acid, silver (1+) salt	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	30.72	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Nitric acid, silver (1+) salt	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	27.74	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Nitric acid, silver (1+) salt	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	25.7	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Nitric acid, silver (1+) salt	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	25.7	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Nitric acid, silver (1+) salt	Leopard Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Birge, W.J., and J.A. Zuiderveen. The Comparative Toxicity of Silver to Aquatic Biota. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 79-87.
Nitric acid, silver (1+) salt	Marbled Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	240	NR	NR	ug/L	LAB	1996. Birge, W.J., and J.A. Zuiderveen. The Comparative Toxicity of Silver to Aquatic Biota. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 79-87.
Nitric acid, silver (1+) salt	Marbled Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	240	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Nitric acid, silver (1+) salt	Pickeral Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	10	NR	NR	ug/L	LAB	1996. Birge, W.J., and J.A. Zuiderveen. The Comparative Toxicity of Silver to Aquatic Biota. In: A.W.Andren and T.W.Bober (Eds.), 3rd Int.Conf.Proc.Transport, Fate and Effects of Silver in the Environment, Aug.6-9, 1995, Washington, D.C.: 79-87.

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Table D-20. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Strontium	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Strontium chloride	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	160	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.

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Table D-21. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Thallium	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Thallium chloride	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	110	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Thallous(I) nitrate	Frog And Toad Order	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.

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Table D-22. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Thorium nitrate	Frog And Toad Order	Amphibians	Fresh	Growth	NR	Not Reported	T	NR	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.

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Table D-23. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Vanadium pentoxide	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	250	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.

Table D-24. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	EC50	Not Reported	T	3600	NA	NR	ug/L	LAB	1988. Dawson, D.A., E.F. Stebler, S.L. Burks, and J.A. Bantle. Evaluation of the Developmental Toxicity of Metal-Contaminated Sediments Using Short-Term Fathead Minnow and Frog Embryo-Larval Assays. Environ. Toxicol. Chem.7(1): 27-34.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	300		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Embryotoxicity and Teratogenicity of Cu2+ and Zn2+ for Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.23(2): 111-120.
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	LOEC	Not Reported	T	4200	NA	NR	ug/L	LAB	1988. Dawson, D.A., E.F. Stebler, S.L. Burks, and J.A. Bantle. Evaluation of the Developmental Toxicity of Metal-Contaminated Sediments Using Short-Term Fathead Minnow and Frog Embryo-Larval Assays. Environ. Toxicol. Chem.7(1): 27-34.
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	1750	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	2000	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	750	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Growth	LOEC	Whole Organism	T	750	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Growth	NOEC	Whole Organism	T	100		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Embryotoxicity and Teratogenicity of Cu2+ and Zn2+ for Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.23(2): 111-120.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Growth	NOEL	Whole Organism	T	300		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Mg2+ -Deprivation Enhances and Mg2+ -Supplementation Diminishes the Embryotoxic and Teratogenic Effects of Ni2+, Co2+, Zn2+, and Cd2+ for Frog Embryos in the FETAX Assay. Ann. Clin. Lab. Sci.23(2): 121-129.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC10	Not Reported	T	410		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Embryotoxicity and Teratogenicity of Cu2+ and Zn2+ for Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.23(2): 111-120.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	850		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Embryotoxicity and Teratogenicity of Cu2+ and Zn2+ for Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.23(2): 111-120.
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1988. Woodall, C., N. MacLean, and F. Crossley. Responses of Trout Fry (Salmo gairdneri) and Xenopus laevis Tadpoles to Cadmium and Zinc. Comp. Biochem. Physiol. C, Comp. Pharmacol. Toxicol.89(1): 93-99.
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	34500	NA	NR	ug/L	LAB	1988. Dawson, D.A., E.F. Stebler, S.L. Burks, and J.A. Bantle. Evaluation of the Developmental Toxicity of Metal-Contaminated Sediments Using Short-Term Fathead Minnow and Frog Embryo-Larval Assays. Environ. Toxicol. Chem.7(1): 27-34.
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	25350	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	28650	NR	NR	ug/L	LAB	1996. Fort, D.J., E.L. Stover, and J.A. Bantle. Integrated Ecological Hazard Assessment of Waste Site Soil Extracts Using FETAX and Short-Term Fathead Minnow Teratogenesis Assay. In: T.W.La Point, F.T.Price, and E.E.Little (Eds.), Environmental Toxicology and Risk Assessment, 4th Volume, ASTM STP 1262, Philadelphia, PA: 93-109.
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	33800	NR	NR	ug/L	LAB	1989. Fort, D.J., B.L. James, and J.A. Bantle. Evaluation of the Developmental Toxicity of Five Compounds with the Frog Embryo Teratogenesis Assay: Xenopus (FETAX) and a Metabolic Activation System. J. Appl. Toxicol.9(6): 377-388.
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	35000	NR	NR	ug/L	LAB	1989. Fort, D.J., B.L. James, and J.A. Bantle. Evaluation of the Developmental Toxicity of Five Compounds with the Frog Embryo Teratogenesis Assay: Xenopus (FETAX) and a Metabolic Activation System. J. Appl. Toxicol.9(6): 377-388.

Table D-24. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	African Clawed Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	NR	NA	NR	ug/L	LAB	1989. Bantle, J.A., D.J. Fort, and B.L. James. Identification of Developmental Toxicants Using the Frog Embryo Teratogenesis Assay-Xenopus (FETAX). Hydrobiologia188-189: 577-585.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LC90	Not Reported	T	1080		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Embryotoxicity and Teratogenicity of Cu2+ and Zn2+ for Xenopus laevis, Assayed by the FETAX Procedure. Ann. Clin. Lab. Sci.23(2): 111-120.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Mortality	LOEL	Not Reported	T	300		NC	umol/L	LAB	1993. Luo, S.Q., M.C. Plowman, S.M. Hopfer, and F.W.,Jr. Sunderman. Mg2+ -Deprivation Enhances and Mg2+ -Supplementation Diminishes the Embryotoxic and Teratogenic Effects of Ni2+, Co2+, Zn2+, and Cd2+ for Frog Embryos in the FETAX Assay. Ann. Clin. Lab. Sci.23(2): 121-129.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Reproduction	NOEL	Sperm	T	1417		NC	ug/L	LAB	2004. Christensen, J.R., C.A. Bishop, J.S. Richardson, B. Pauli, and J. Elliott. Validation of an Amphibian Sperm Inhibition Toxicological Test Method Using Zinc. Environ. Toxicol. Chem.23(12): 2950-2955.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Reproduction	NOEL	Sperm	T	1417		NC	ug/L	LAB	2004. Christensen, J.R., C.A. Bishop, J.S. Richardson, B. Pauli, and J. Elliott. Validation of an Amphibian Sperm Inhibition Toxicological Test Method Using Zinc. Environ. Toxicol. Chem.23(12): 2950-2955.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Reproduction	NOEL	Sperm	T	1417		NC	ug/L	LAB	2004. Christensen, J.R., C.A. Bishop, J.S. Richardson, B. Pauli, and J. Elliott. Validation of an Amphibian Sperm Inhibition Toxicological Test Method Using Zinc. Environ. Toxicol. Chem.23(12): 2950-2955.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Reproduction	NOEL	Sperm	T	1417		NC	ug/L	LAB	2004. Christensen, J.R., C.A. Bishop, J.S. Richardson, B. Pauli, and J. Elliott. Validation of an Amphibian Sperm Inhibition Toxicological Test Method Using Zinc. Environ. Toxicol. Chem.23(12): 2950-2955.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Reproduction	NOEL	Sperm	T	1417		NC	ug/L	LAB	2004. Christensen, J.R., C.A. Bishop, J.S. Richardson, B. Pauli, and J. Elliott. Validation of an Amphibian Sperm Inhibition Toxicological Test Method Using Zinc. Environ. Toxicol. Chem.23(12): 2950-2955.
Zinc chloride (ZnCl2)	African Clawed Frog	Amphibians	Fresh	Reproduction	NR	Sperm	T	NR		NC	ug/L	LAB	2004. Christensen, J.R., C.A. Bishop, J.S. Richardson, B. Pauli, and J. Elliott. Validation of an Amphibian Sperm Inhibition Toxicological Test Method Using Zinc. Environ. Toxicol. Chem.23(12): 2950-2955.
Methylarsonic acid, Zinc salt (1:1)	Bog Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	F	71871	NR	NR	ug/L	LAB	1993. Pan, D.Y., and X.M. Liang. Safety Study of Pesticides on Bog Frog, a Predatory Natural Enemy of Pest in Paddy Field. J. Hunan Agricult. Coll.19(1): 47-54.
Zinc	Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	130000	NA	NR	ug/L	LAB	1992. Zang, W., X. Xu, X. Dai, and Z. Zhu. Acute Toxicity and Accumulation of Zn2+ on Young Freshwater Grouper (Cichlasoma managuense) and Bullfrog (Rana catesbeiana) Tadpole. Freshwater Fish. (Danshui Yuye)6: 12-14.
Zinc	Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	110000	NA	NR	ug/L	LAB	1992. Zang, W., X. Xu, X. Dai, and Z. Zhu. Acute Toxicity and Accumulation of Zn2+ on Young Freshwater Grouper (Cichlasoma managuense) and Bullfrog (Rana catesbeiana) Tadpole. Freshwater Fish. (Danshui Yuye)6: 12-14.
Zinc	Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	70000	NA	NR	ug/L	LAB	1992. Zang, W., X. Xu, X. Dai, and Z. Zhu. Acute Toxicity and Accumulation of Zn2+ on Young Freshwater Grouper (Cichlasoma managuense) and Bullfrog (Rana catesbeiana) Tadpole. Freshwater Fish. (Danshui Yuye)6: 12-14.
Sulfuric acid, Zinc salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	50030	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid, Zinc salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	47260	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid, Zinc salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	25650	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Sulfuric acid, Zinc salt (1:1)	Common Indian Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	19860	NA	NR	ug/L	LAB	1987. Khangarot, B.S., and P.K. Ray. Sensitivity of Toad Tadpoles, Bufo melanostictus (Schneider), to Heavy Metals. Bull. Environ. Contam. Toxicol.38(3): 523-527.
Zinc	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1979. Birge, W.J., J.A. Black, and A.G. Westerman. Evaluation of Aquatic Pollutants Using Fish and Amphibian Eggs as Bioassay Organisms. In: S.W.Nielsen, G.Migaki, and D.G.Scarpelli (Eds.), Symp.Animals Monitors Environ.Pollut.1977, Storrs, CT12: 108-118.
Zinc chloride (ZnCl2)	Eastern Narrow-Mouthed Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	10	NA	NR	ug/L	LAB	1978. Birge, W.J.. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. In: J.H.Thorp and J.W.Gibbons (Eds.), Dep.Energy Symp.Ser., Energy and Environmental Stress in Aquatic Systems, Augusta, GA48: 219-240.
Sulfuric acid, Zinc salt (1:1)	Ferguson'S Dwarf Toad	Amphibians	Fresh	Growth	NOEC	Not Reported	T	0.1		NC	%	LAB	2000. Saxena, S., and H. Chaturvedi. Effect of Zinc on the Development of Toad, Bufo fergusonii. J. Ecotoxicol. Environ. Monit.10(4): 259-263.
Sulfuric acid, Zinc salt (1:1)	Ferguson'S Dwarf Toad	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	0.1		NC	%	LAB	2000. Saxena, S., and H. Chaturvedi. Effect of Zinc on the Development of Toad, Bufo fergusonii. J. Ecotoxicol. Environ. Monit.10(4): 259-263.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	24060	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.

Table D-24. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	25420	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	23420	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	24380	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	23070	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	23510	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	22410	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	23080	NA	NR	ug/L	LAB	1987. Rao, I.J., and M.N. Madhyastha. Toxicities of Some Heavy Metals to the Tadpoles of Frog, Microhyla ornata (Dumeril & Bibron). Toxicol. Lett.36(2): 205-208.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	20180		NC	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. Protective Action of Chelating Agent EDTA on Copper and Zinc Toxicity to Frog Tadpoles. Natl. Acad. Sci. Lett.7(6): 201-203.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	7820		NC	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. Protective Action of Chelating Agent EDTA on Copper and Zinc Toxicity to Frog Tadpoles. Natl. Acad. Sci. Lett.7(6): 201-203.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3650		NC	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. Protective Action of Chelating Agent EDTA on Copper and Zinc Toxicity to Frog Tadpoles. Natl. Acad. Sci. Lett.7(6): 201-203.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3170		NC	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. Protective Action of Chelating Agent EDTA on Copper and Zinc Toxicity to Frog Tadpoles. Natl. Acad. Sci. Lett.7(6): 201-203.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2100		NC	ug/L	LAB	1984. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. Protective Action of Chelating Agent EDTA on Copper and Zinc Toxicity to Frog Tadpoles. Natl. Acad. Sci. Lett.7(6): 201-203.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	20180	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 4: Effects of Chelating Agent EDTA on the Acute Toxicity of Copper and Zinc on Tadpoles of the Frog Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(1): 121-125.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	7820	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	7820	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 4: Effects of Chelating Agent EDTA on the Acute Toxicity of Copper and Zinc on Tadpoles of the Frog Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(1): 121-125.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3660	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3660	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 4: Effects of Chelating Agent EDTA on the Acute Toxicity of Copper and Zinc on Tadpoles of the Frog Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(1): 121-125.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3170	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	3170	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 4: Effects of Chelating Agent EDTA on the Acute Toxicity of Copper and Zinc on Tadpoles of the Frog Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(1): 121-125.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 5: Acute Toxicity of Selected Heavy Metals on the Tadpoles of Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(2): 259-263.
Sulfuric acid, Zinc salt (1:1)	Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2100	NA	NR	ug/L	LAB	1985. Khangarot, B.S., A. Sehgal, and M.K. Bhasin. "Man and Biosphere" - Studies on the Sikkim Himalayas. Part 4: Effects of Chelating Agent EDTA on the Acute Toxicity of Copper and Zinc on Tadpoles of the Frog Rana hexadactyla. Acta Hydrochim. Hydrobiol.13(1): 121-125.
Zinc nitrate	Frog And Toad Order	Amphibians	Fresh	Growth	NR	Not Reported	T	0.0002	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.

Table D-24. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc nitrate	Frog And Toad Order	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	%	LAB	1925. Dilling, W.J., and C.W. Healey. Influence of Lead and the Metallic Ions of Copper, Zinc, Thorium, Beryllium and Thallium on the Germination of Frogs' Spawn and on the Growth of Tadpoles. Ann. Appl. Biol.13: 177-188.
Sulfuric acid, Zinc salt (1:1)	Iberian Ribbed Newt	Amphibians	Fresh	Mortality	NR	Not Reported	T	10000	NR	NR	ug/L	LAB	1996. Godet, F., M. Babut, D. Burnel, A.M. Veber, and P. Vasseur. The Genotoxicity of Iron and Chromium in Electroplating Effluents. Mutat. Res.370(1): 19-28.
Zinc chloride (ZnCl2)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Toxicity of Metals and Low pH to Embryos and Larvae of the Jefferson Salamander, Ambystoma jeffersonianum. Arch. Environ. Contam. Toxicol.29(1): 110-114.
Zinc chloride (ZnCl2)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	D	NR	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Toxicity of Metals and Low pH to Embryos and Larvae of the Jefferson Salamander, Ambystoma jeffersonianum. Arch. Environ. Contam. Toxicol.29(1): 110-114.
Zinc chloride (ZnCl2)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR	Not Reported	T	115	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Zinc chloride (ZnCl2)	Jefferson's Salamander	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	115	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Zinc chloride (ZnCl2)	Marbled Salamander	Amphibians	Fresh	Mortality	LC50	Not Reported	T	2380	NA	NR	ug/L	LAB	1978. Birge, W.J., J.E. Hudson, J.A. Black, and A.G. Westerman. Embryo-Larval Bioassays on Inorganic Coal Elements and In Situ Biomonitoring of Coal-Waste Effluents. In: Symp., U.S.Fish Wildl.Serv., Dec.3-6, 1978, Surface Mining Fish Wildl.needs in Eastern U.S., WV: 97-104.
Zinc nitrate	Spotted Frog	Amphibians	Fresh	Growth	NR	Not Reported	T	50	NR	NR	ug/L	FIELDA	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Zinc nitrate	Spotted Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	28380	NR	NR	ug/L	LAB	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Zinc nitrate	Spotted Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	28380	NR	NR	ug/L	LAB	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Zinc nitrate	Spotted Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	28380	NR	NR	ug/L	LAB	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Zinc nitrate	Spotted Frog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	28380	NR	NR	ug/L	LAB	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Zinc nitrate	Spotted Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	FIELDA	1998. Lefcort, H., R.A. Meguire, L.H. Wilson, and W.F. Ettinger. Heavy Metals Alter the Survival, Growth, Metamorphosis, and Antipredatory Behavior of Columbia Spotted Frog (Rana luteiventris) Tadpoles. Arch. Environ. Contam. Toxicol.35(3): 447-456.
Sulfuric acid, Zinc salt (1:1)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	LC50	Not Reported	T	0.0069		NC	%	LAB	1999. Kumar, S.. Morphological and Anatomical Alterations in Tadpole Larvae of Frog, Rana tigrina Daudin, 1802 due to Toxic Effect of Copper, Zinc and Lead. J. Adv. Zool.20(2): 90-94.
Sulfuric acid, Zinc salt (1:1)	Tiger Frog, Indian Bullfrog	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	0.012		NC	%	LAB	1999. Kumar, S.. Morphological and Anatomical Alterations in Tadpole Larvae of Frog, Rana tigrina Daudin, 1802 due to Toxic Effect of Copper, Zinc and Lead. J. Adv. Zool.20(2): 90-94.
Zinc chloride (ZnCl2)	Toad	Amphibians	Fresh	Mortality	LC10	Not Reported	T	15000		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Zinc chloride (ZnCl2)	Toad	Amphibians	Fresh	Mortality	LC50	Not Reported	T	28000		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Zinc chloride (ZnCl2)	Toad	Amphibians	Fresh	Mortality	LC90	Not Reported	T	45000		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Zinc chloride (ZnCl2)	Toad	Amphibians	Fresh	Mortality	LOEL	Not Reported	T	30000		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Zinc	Toad	Amphibians	Fresh	Mortality	NOEC	Embryo	T	2000		NC	ug/L	LAB	1989. Herkovits, J., C.S. Perez-Coll, and S. Zeni. Protective Effect of Zinc Against Spontaneous Malformations and Lethality in Bufo arenarum Embryos. Biol. Trace Elem. Res.22: 247-250.

Table D-24. Summary of Results from the EcoTox Database for Amphibians and Reptiles - Cadmium

Chemical	Common Name	Class	Water Type	Effect	Endpoint	Response Site Description	Conc 1 Type	Conc 1	Conc 2 Type	Conc 2	Conc Units	Test Type	Citation
Zinc	Toad	Amphibians	Fresh	Mortality	NOEC	Embryo	T	2000		NC	ug/L	LAB	1989. Herkovits, J., C.S. Perez-Coll, and S. Zeni. Protective Effect of Zinc Against Spontaneous Malformations and Lethality in Bufo arenarum Embryos. Biol. Trace Elem. Res.22: 247-250.
Zinc	Toad	Amphibians	Fresh	Mortality	NOEC	Embryo	T	2000		NC	ug/L	LAB	1989. Herkovits, J., C.S. Perez-Coll, and S. Zeni. Protective Effect of Zinc Against Spontaneous Malformations and Lethality in Bufo arenarum Embryos. Biol. Trace Elem. Res.22: 247-250.
Zinc chloride (ZnCl2)	Toad	Amphibians	Fresh	Mortality	NOEL	Not Reported	T	30000		NC	ug/L	LAB	2002. Herkovits, J., L. Corro, C. Perez-Coll, and O. Dominguez. Fluid Motion Effect on Metal Toxicity in Bufo arenarum Embryos. Bull. Environ. Contam. Toxicol.68(4): 549-554.
Zinc	Toad	Amphibians	Fresh	Mortality	NR	Embryo	T	NR		NC	ug/L	LAB	1989. Herkovits, J., C.S. Perez-Coll, and S. Zeni. Protective Effect of Zinc Against Spontaneous Malformations and Lethality in Bufo arenarum Embryos. Biol. Trace Elem. Res.22: 247-250.
Zinc	Toad	Amphibians	Fresh	Mortality	NR	Embryo	T	NR		NC	ug/L	LAB	1989. Herkovits, J., C.S. Perez-Coll, and S. Zeni. Protective Effect of Zinc Against Spontaneous Malformations and Lethality in Bufo arenarum Embryos. Biol. Trace Elem. Res.22: 247-250.
Zinc	Toad	Amphibians	Fresh	Mortality	NR	Embryo	T	NR		NC	ug/L	LAB	1989. Herkovits, J., C.S. Perez-Coll, and S. Zeni. Protective Effect of Zinc Against Spontaneous Malformations and Lethality in Bufo arenarum Embryos. Biol. Trace Elem. Res.22: 247-250.
Zinc	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NA	NR	ug/L	LAB	1991. Herkovits, J., and C.S. Perez-Coll. Antagonism and Synergism Between Lead and Zinc in Amphibian Larvae. Environ. Pollut.69: 217-221.
Sulfuric acid, Zinc salt (1:1)	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR		NC	ug/L	LAB	1997. Saxena, S.. Effects of Zinc on the Development of Gonads in the Tadpoles of Toad Bufo andersonii. J. Ecotoxicol. Environ. Monit.7(1): 11-15.
Sulfuric acid, Zinc salt (1:1)	Toad	Amphibians	Fresh	Mortality	NR	Not Reported	T	NR	NR	NR	ug/L	LAB	1998. Herkovits, J., and L.A. Helguero. Copper Toxicity and Copper-Zinc Interactions in Amphibian Embryos. Sci. Total Environ.221(1): 1-10.
Zinc	Toad	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	8000	NA	NR	ug/L	LAB	1991. Herkovits, J., and C.S. Perez-Coll. Antagonism and Synergism Between Lead and Zinc in Amphibian Larvae. Environ. Pollut.69: 217-221.
Sulfuric acid, Zinc salt (1:1)	Toad	Amphibians	Fresh	Mortality	NR-ZERO	Not Reported	T	8000		NC	ug/L	LAB	1997. Saxena, S.. Effects of Zinc on the Development of Gonads in the Tadpoles of Toad Bufo andersonii. J. Ecotoxicol. Environ. Monit.7(1): 11-15.
Sulfuric acid, Zinc salt (1:1)	Western Toad	Amphibians	Fresh	Mortality	NR-LETH	Not Reported	T	39000	NA	NR	ug/L	LAB	1976. Porter, K.R., and D.E. Hakanson. Toxicity of Mine Drainage to Embryonic and Larval Boreal Toads (Bufonidae: Bufo boreas). Copeia2: 327-331.
Zinc chloride (ZnCl2)	Wood Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	115	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.
Zinc chloride (ZnCl2)	Wood Frog	Amphibians	Fresh	Mortality	NR	Not Reported	T	115	NA	NR	ug/L	LAB	1995. Horne, M.T., and W.A. Dunson. Effects of Low pH, Metals, and Water Hardness on Larval Amphibians. Arch. Environ. Contam. Toxicol.29(4): 500-505.

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Table D-25. Acronyms for Summary of Results from the EcoTox Database for Amphibians and Reptiles

% g = percent grams
% v/v = percent volume per volume
* = denotes value is the dilution water chemistry (aquatic), denotes value is from the pretreatment media (soil)
A = analytical grade
AI = active ingredient
AM = analytical grade, measured
AN = analytical grade, nominal
Bq = becquerels
cc = cocoons
d = day
D = dissolved
ECXX = effective concentration to XX% of test organisms
EDXX = effective dose to XX% of test organisms
ERXX = effective residue concentration to XX% of test organisms
F = formulation
fd = food
FIELDA = undefined
FIELDN = undefined
FIELDU = undefined
g = gram
h = hour
I = inorganic monomeric
ICXX = inhibition concentration to XX% of test organisms
kg = kilograms
L = liter
LAB = laboratory
lb = pounds
LCXX = lethal concentration to XX% of test organisms
LDXX = lethal dose to XX% of test organisms
LETC = lethal threshold concentration
LOEC = lowest observable effect concentration
LOEL = lowest observable effect level
LRXX = lethal residue concentration to XX% of test organisms
M = molar
m2 = square meter
MATC = maximum acceptable toxicant concentration
mg = milligram
ml = milliliter
mM = millimolar
mmol = millimole
mol/L = moles per liter
molal = molality
N = normal
NA = not applicable
NC = not coded
NE = no effect
ng = nanogram
nM = nanomolar
nmol = nanomoles
NOEC = no observable effect concentration
NOEL = no observable effect level
NOER = no observable effect residue
NR = not reported
NR-LETH = 100% mortality or 0% survival of test organisms
NR-ZERO = 0% mortality or 100% survival of test organisms
org = organism
Pop growth = population growth
SE = significant effect
T = total
uCI = microcuries
ug = micrograms
uM = micromolar
umol = micromoles

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Table D-26. Effects Based Tissue Concentrations for Amphibians and Reptiles - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	f	Body Part	Citation
Salamander	Amphibian		Larval	Growth	4.7	LOED	Water	Whole Body	1995. Nebeker AV, GS Schuytema, SL Ott. Arch Environ Contam Toxicol 29:492-499
Salamander	Amphibian		Larval	Growth	6.28	LOED	Water	Whole Body	1995. Nebeker AV, GS Schuytema, SL Ott. Arch Environ Contam Toxicol 29:492-499
Salamander	Amphibian		Larval	Growth	4.7	LOED	Absorption	Whole Body	1995. Nebeker, AV, Schuytema, G.S., and S.L. Ott. Arch Environ Contam Toxicol 29:492-503
Salamander	Amphibian		Larval	Growth	6.28	LOED	Absorption	Whole Body	1995. Nebeker, AV, Schuytema, G.S., and S.L. Ott. Arch Environ Contam Toxicol 29:492-503
Salamander	Amphibian		Larval	Growth	1.62	NOED	Water	Whole Body	1995. Nebeker AV, GS Schuytema, SL Ott. Arch Environ Contam Toxicol 29:492-499
Salamander	Amphibian		Larval	Growth	3.75	NOED	Water	Whole Body	1995. Nebeker AV, GS Schuytema, SL Ott. Arch Environ Contam Toxicol 29:492-499
Salamander	Amphibian		Larval	Growth	1.62	NOED	Absorption	Whole Body	1995. Nebeker, AV, Schuytema, G.S., and S.L. Ott. Arch Environ Contam Toxicol 29:492-503
Salamander	Amphibian		Larval	Growth	3.75	NOED	Absorption	Whole Body	1995. Nebeker, AV, Schuytema, G.S., and S.L. Ott. Arch Environ Contam Toxicol 29:492-503
Salamander	Amphibian		Larval	Growth	43.5	NOED	Ingestion	Whole Body	1995. Nebeker, AV, Schuytema, G.S., and S.L. Ott. Arch Environ Contam Toxicol 29:492-503
Salamander	Amphibian		Immature	Growth	145	NOED	Ingestion	Whole Body	1995. Nebeker, AV, Schuytema, G.S., and S.L. Ott. Arch Environ Contam Toxicol 29:492-503
Salamander	Amphibian		Larval	Mortality	4.13	NOED	Absorption	Whole Body	1995. Nebeker, AV, Schuytema, G.S., and S.L. Ott. Arch Environ Contam Toxicol 29:492-503
Salamander	Amphibian		Larval	Mortality	43.5	NOED	Ingestion	Whole Body	1995. Nebeker, AV, Schuytema, G.S., and S.L. Ott. Arch Environ Contam Toxicol 29:492-503
Salamander	Amphibian		Immature	Mortality	145	NOED	Ingestion	Whole Body	1995. Nebeker, AV, Schuytema, G.S., and S.L. Ott. Arch Environ Contam Toxicol 29:492-503

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Table D-27. Effects Based Tissue Concentrations for Amphibians and Reptiles - Chlordane

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
American alligator	Reptile		Adult	Reproduction	0.708	ED28	Combined	Adipose	2004. Rauschenberger RH, JJ Wiebe, JS Buckland, JT Smith, MS Sepulveda, TS Gross. Mar Environ Res 58:851-856
American alligator	Reptile		Adult	Reproduction	0.023	ED28	Combined	Liver	2004. Rauschenberger RH, JJ Wiebe, JS Buckland, JT Smith, MS Sepulveda, TS Gross. Mar Environ Res 58:851-856

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Table D-28. Effects Based Tissue Concentrations for Amphibians and Reptiles - Iron

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Green Frog	Amphibian		Adult	Physiological	220	NOED	Combined	Whole Body	2001. Gillilland, C.D., C.L. Summer, M. G. Gillilland, K. Kannan, D.K. Villeneuve, K.K. C.oady, P. Muzzall, C. Mehne, J.P Giesy. Chemosphere 44:327-339
Green Frog	Amphibian		Juvenile	Physiological	3800	NOED	Combined	Whole Body	2001. Gillilland, C.D., C.L. Summer, M. G. Gillilland, K. Kannan, D.K. Villeneuve, K.K. C.oady, P. Muzzall, C. Mehne, J.P Giesy. Chemosphere 44:327-339
Green Frog	Amphibian		Larval	Physiological	13000	NOED	Combined	Whole Body	2001. Gillilland, C.D., C.L. Summer, M. G. Gillilland, K. Kannan, D.K. Villeneuve, K.K. C.oady, P. Muzzall, C. Mehne, J.P Giesy. Chemosphere 44:327-339

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Table D-29. Effects Based Tissue Concentrations for Amphibians and Reptiles - Lead

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Bullfrog	Amphibian		Larval	Mortality	600	NOED	Water	Gut	2002. Rice, T.M., J.T. Oris, D.H. Taylor. Bull Environ Contam Toxicol 68:8-17

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Table D-30. Effects Based Tissue Concentrations for Amphibians and Reptiles - PCBs

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
African Clawed Frog	Amphibian		Larval	Growth	114.09	LOED	Water	Whole Body	2003. Fisher, M.A., A.M. Jelaso, A. Predenkiewicz, L. Schuster, J. Means, C.F. Ide. Environ Tox & Chem 22(2):321-328
African Clawed Frog	Amphibian		Larval	Growth	956.44	LOED	Water	Whole Body	2003. Fisher, M.A., A.M. Jelaso, A. Predenkiewicz, L. Schuster, J. Means, C.F. Ide. Environ Tox & Chem 22(2):321-328
African Clawed Frog	Amphibian		Larval	Mortality	956.44	LD27	Water	Whole Body	2003. Fisher, M.A., A.M. Jelaso, A. Predenkiewicz, L. Schuster, J. Means, C.F. Ide. Environ Tox & Chem 22(2):321-328
African Clawed Frog	Amphibian		Larval	Mortality	1660.28	LD83	Water	Whole Body	2003. Fisher, M.A., A.M. Jelaso, A. Predenkiewicz, L. Schuster, J. Means, C.F. Ide. Environ Tox & Chem 22(2):321-328
African Clawed Frog	Amphibian		Larval	Mortality	4163.84	LD96	Water	Whole Body	2003. Fisher, M.A., A.M. Jelaso, A. Predenkiewicz, L. Schuster, J. Means, C.F. Ide. Environ Tox & Chem 22(2):321-328
African Clawed Frog	Amphibian		Larval	Mortality	956.44	LOED	Water	Whole Body	2003. Fisher, M.A., A.M. Jelaso, A. Predenkiewicz, L. Schuster, J. Means, C.F. Ide. Environ Tox & Chem 22(2):321-328
African Clawed Frog	Amphibian		Larval	Mortality	114.09	NOED	Water	Whole Body	2003. Fisher, M.A., A.M. Jelaso, A. Predenkiewicz, L. Schuster, J. Means, C.F. Ide. Environ Tox & Chem 22(2):321-328
Snapping Turtle	Reptile		Adult	Growth	0.475	EC02	Ingestion	Blood	2008. Kelly SM, KM Eisenreich, JE Baker, CL Rogue. Envrion Toxicol & Chem 27(12):2565-2574
Snapping Turtle	Reptile		Adult	Growth	0.475	EC02	Ingestion	Blood	2008. Kelly SM, KM Eisenreich, JE Baker, CL Rogue. Envrion Toxicol & Chem 27(12):2565-2574
Snapping Turtle	Reptile		Adult	Growth	0.125	EC03	Ingestion	Blood	2008. Kelly SM, KM Eisenreich, JE Baker, CL Rogue. Envrion Toxicol & Chem 27(12):2565-2574
Snapping Turtle	Reptile		Adult	Growth	0.125	EC03	Ingestion	Blood	2008. Kelly SM, KM Eisenreich, JE Baker, CL Rogue. Envrion Toxicol & Chem 27(12):2565-2574

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Table D-31. Effects Based Tissue Concentrations for Amphibians and Reptiles - Selenium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Common Slider	Amphibian		Egg	Mortality	1.47	ED06	Absorption	Whole Body	2001. Nagle, RD, CL Rowe, JD Congdon. Arch Environ Contam Toxicol 40:531-536
Common Slider	Amphibian		Egg	Reproduction	1.47	ED06	Absorption	Whole Body	2001. Nagle, RD, CL Rowe, JD Congdon. Arch Environ Contam Toxicol 40:531-536
Common Slider	Amphibian		Egg	Reproduction	1.47	NOED	Absorption	Whole Body	2001. Nagle, RD, CL Rowe, JD Congdon. Arch Environ Contam Toxicol 40:531-536

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Table D-32. Effects Based Tissue Concentrations for Amphibians and Reptiles - Zinc

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Amphibian	Amphibian		Embryo	Mortality	96.2	LD24	Water	Liver	2001. Naab, F., M. Volcomirsky, A. Burlon, M.E. Caraballo, M. Debray, J.M. Kesque, A.J. Kreiner, M.J. Ozafran, J.A. Schuff, P. Stoliar, M.E. Vazquez, J. Davidson, T.M. Fonovich. Arch Environ Contam Toxicol 41:201-207
Amphibian	Amphibian		Embryo	Mortality	91.95	LD24	Water	Ovary	2001. Naab, F., M. Volcomirsky, A. Burlon, M.E. Caraballo, M. Debray, J.M. Kesque, A.J. Kreiner, M.J. Ozafran, J.A. Schuff, P. Stoliar, M.E. Vazquez, J. Davidson, T.M. Fonovich. Arch Environ Contam Toxicol 41:201-207

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Table D-33. Acronyms for Effects Based Tissue Concentrations for Amphibians and Reptiles

ECXX = effect concentration for XX% of test population
EDXX = effect dose for XX% of test population
IPXX = undefined
kg = kilogram
LCXX = concentration lethal to XX% of test population
LDXX = dose lethal to XX% of test population
LOED = lowest observable effect dose
mg = milligram
NA = not applicable
NOED = no observable effect dose
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
ww = wet weight

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Appendix E

Exposure Pathways – Birds

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Aluminum																							
Reproduction																							
Aluminum sulfate		Ringed Dove (*Streptopelia risoria*)	109.7	mg/kg diet	no	NR	FD	4	months			AD	NR	WO	109.7		yes	0.155	yes	0.017	109.7		Carriere et al, 1986
Arsenic																							
Reproduction																							
Arsenic oxide	100	Chicken (Gallus domesticus)	0/7.5/15.0/30.0	mg/kg diet	no	na	FD	19	day	49	weeks	LB	female	WO	30		No	1.6	yes	1.19E-01	2.24		Holcman and Stibilj, 1997
Growth																							
Arsenic oxide	100	Chicken (*Gallus domesticus*)	0/7.5/15.0/30.0	mg/kg diet	no	na	FD	19	day	49	weeks	SM	female	WO	30.0		No	1.6	yes	1.19E-01	2.24		Holcman and Stibilj, 1997
Sodium arsenate	100	Mallard duck (*Anas platyrhynchos*)	0/30/100/300	mg/kg diet	yes	12.1	FD	2	weeks	1	days	JV	female	WO		30.0	yes	0.160	yes	7.00E-03		1.49	Camardese et al, 1990
Arsenic trichloride	100	Chicken (*Gallus domesticus*)	0/50	mg/kg diet	no	na	FD	21	day	1	days	JV	both	WO		50.0	No	0.564	no	4.01E-02		3.55	Howell and Hill, 1978
Sodium arsenate	100	Mallard duck (*Anas platyrhynchos*)	0/200	mg/kg diet	no	6	FD	4	weeks	1	days	JV	both	WO		200	yes	0.384	no	3.12E-02		17.3	Hoffman et al, 1992
Survival																							
Arsenic oxide	100	Chicken (*Gallus domesticus*)	0/7.5/15.0/30.0	mg/kg diet	no	na	FD	19	day	49	weeks	SM	female	WO	30.0		No	1.6	yes	1.19E-01	2.24		Holcman and Stibilj, 1997
Arsenic trichloride	100	Chicken (*Gallus domesticus*)	0/50	mg/kg diet	no	na	FD	21	day	1	days	JV	both	WO	50.0		No	0.564	no	4.01E-02	3.55		Howell and Hill, 1978
Sodium arsenate	100	Mallard duck (*Anas platyrhynchos*)	0/30/100/300	mg/kg diet	yes	12.1	FD	10	weeks	1	days	JV	both	WO	300		yes	1.10	yes	1.20E-02	3.72		Camardese et al, 1990
Sodium arsenate	100	Mallard duck (*Anas platyrhynchos*)	0/200	mg/kg diet	no	6	FD	4	weeks	1	days	JV	both	WO	200		yes	0.384	no	3.12E-02	17.3		Hoffman et al, 1992
Barium																							
Survival																							
Barium hydroxide		Chicken (*Gallus domesticus*)	250/500/1000/2000/4000/8000/16,000/32,000	ppm	no	NR	FD	4	weeks	1	day	JV	NR	WO	2000		yes	0.121	yes	1.26E-02	208.3	416.53	Johnson et al, 1960
Boron																							
Reproduction																							
Boric acid		Mallard duck (*Anas platyrhynchos*)	8/35/288/1000	ppm	no	NR	FD	12	weeks	NR	NR	AD	NR	WO	288	1000	yes	1.000	yes	1.00E-01	28.8	100	Smith and Anders, 1989
Cadmium																							
Reproduction																							
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/3/12/48	ug/g diet	no	NR	FD	12	weeks	8	months	LB	female	WO	12.0	48.0	No	1.6	no	7.90E-02	0.593	2.37	Leach et al, 1978
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/3/12/48	ug/g diet	no	NR	FD	12	months	6	months	LB	female	WO	12.0	48.0	No	1.6	no	7.90E-02	0.593	2.37	Leach et al, 1978
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/25/75	mg/kg diet	no	NR	FD	39	weeks	14	days	IM	male	TE	25.0	75.0	yes	5.58	no	1.78E-01	0.799	2.40	Bokori et al, 1996
Cadmium chloride	100	Mallard Duck (*Anas platyrhychos*)	0/1.6/15.2/210	mg/kg diet	yes	10	FD	90	day	1	years	AD	female	NR	15.2	210	yes	1.153	yes	1.10E-01	1.53	21.1	White and Finley, 1978
Cadmium chloride	100	Mallard (*Anas platyrhynchos*)	0/1.6/15.2/210	mg/kg diet	yes	10	FD	90	day	1	years	AD	both	TE	15.2	210	yes	1.153	yes	1.10E-01	1.53	21.1	White et al 1978
Cadmium chloride	100	Mallard Duck (*Anas platyrhychos*)	0/10/50	ug/g diet	yes	10	FD	42	day	32	weeks	JV	male	TE	50.0		yes	1.153	yes	8.72E-02	4.20		Di Giulio and Scanlon, 1985
cadmium chloride	100	Chicken (*Gallus domesticus*)	0/60	mg/kg diet	no	NR	FD	23	day	16	months	LB	female	WO		60.0	No	1.6	yes	6.40E-02		2.40	Sell, 1975
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/75/300/600	mg/kg diet	no	NR	FD	5	weeks	21	days	JV	male	TE		75.0	yes	1.596	no	7.89E-02		3.71	Bokori et al, 1995
Cadmium sulfate	100	Japanese Quail (*Coturnix japonica*)	0/75/150/300	mg/kg diet	no	NR	FD	37	day	NR	NR	LB	female	WO		75.0	yes	0.2	no	2.04E-02		7.65	Bokori, et al, 1995
Cadmium chloride	100	Japanese Quail (*Coturnix japonica*)	0/75	mg/kg diet	no	NR	FD	6	weeks	1	days	JV	male	TE		75.0	yes	0.082	no	1.14E-02		10.4	Richardson et al, 1974
Growth																							
Cadmium chloride	100	Japanese Quail (*Coturnix japonica*)	0/62/125/250/500/1000	ug/kg diet	no	NR	FD	7	day	7	days	JV	both	WO	1000		yes	0.0415	yes	5.17E-03	0.125		Jacobs et al, 1978
Cadmium	100	Japanese Quail (*Coturnix japonica*)	0/2.00	mg/kg diet	no	NR	FD	63	day	1	days	JV	both	WO	2.00		No	0.1	no	1.30E-02	0.260		Stoewsand et al 1986
Cadmium chloride	100	Chicken (*Gallus domesticus*)	0/10/100	mg/kg diet	no	NR	FD	5	weeks	1	days	JV	NR	WO	10.0	100	yes	0.284	yes	2.01E-02	0.708	7.08	Lefevre et al, 1982
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/3/12/48	ug/g diet	no	NR	FD	6	weeks	1	days	JV	male	WO	12.0	48.0	yes	0.619	no	4.26E-02	0.826	3.30	Leach et al, 1978
Cadmium chloride	100	Mallard Duck (*Anas platyrhychos*)	0/4.3/9.2/14.6	mg/kg diet	yes	10	FD	12	weeks	1	days	JV	both	WO	14.6		yes	1.128	no	6.30E-02	0.858		Cain et al, 1983
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/14.6	mg/kg diet	no	NR	FD	2	weeks	1	days	JV	both	WO	14.6		No	0.328	no	2.82E-02	1.25		Hill, 1974
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/25/75	mg/kg diet	no	NR	FD	4	weeks	14	days	JV	male	WO	25.0	75.0	yes	0.828	no	5.15E-02	1.55	4.66	Bokori et al, 1996
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/20/40/60	mg/kg diet	no	NR	FD	2	weeks	1	days	JV	female	WO	20.0	40.0	No	0.328	no	2.82E-02	1.72	3.44	Hill 1979
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/20/40/60/80/100	mg/kg diet	no	NR	FD	2	weeks	1	days	JV	both	WO	20.0	40.0	No	0.328	no	2.82E-02	1.72	3.44	Hill, 1974
Cadmium chloride	100	Mallard Duck (*Anas platyrhychos*)	0/10/50	ug/g diet	yes	10	FD	42	day	32	weeks	JV	male	WO	50.0		yes	1.153	yes	8.72E-02	4.20		Di Giulio and Scanlon, 1985
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/10/20/40	mg/kg diet	no	NR	FD	2	weeks	1	days	JV	NR	WO	40.0		yes	0.18	no	1.91E-02	4.24		Blalock and Hill, 1988
Cadmium chloride	100	Wood duck (*Aix sponsa*)	0/2.18/7.61/77.85	mg/kg diet	no	NR	FD	12	weeks	1	weeks	JV	both	WO	77.85		yes	0.4988	no	3.70E-02	5.76		Mayack et al, 1981
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/75	mg/kg diet	no	NR	FD	2	weeks	1	days	JV	female	WO	75.0		No	0.328	no	2.82E-02	6.44		Hill 1979
Cadmium chloride	61.32	Mallard Duck (*Anas platyrhychos*)	0/50/150/450	mg/kg diet	yes	10	FD	42	day	11	months	JV	male	WO	150	450	yes	1.11	yes	1.36E-01	12.5	37.6	Di Giulio and Scanlon, 1984
Cadmium chloride	61.32	Chicken (*Gallus domesticus*)	0/10/100	mg/L	no	NR	DR	30	day	1	days	JV	NR	WO		10.0	No	0.0397	no	6.79E-03		1.05	Fadil and Magid, 1996
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/60	mg/kg diet	no	NR	FD	18	day	1	days	JV	female	WO		60.0	No	0.564	no	4.01E-02		4.26	Hill, 1990
Cadmium chloride	100	Chicken (*Gallus domesticus*)	0/45	mg/kg diet	no	NR	FD	14	day	8	days	JV	male	WO		45.0	No	0.288	no	2.59E-02		4.80	Bafundo et al. 1984
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/57	mg/kg diet	no	NR	FD	2	weeks	1	days	JV	both	WO		57.0	No	0.328	no	2.82E-02		4.90	Hill, 1974
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/75/300/600	mg/kg diet	no	NR	FD	1	weeks	21	days	JV	male	WO		75.0	yes	0.484	no	3.63E-02		5.63	Bokori et al, 1995
Cadmium carbonate	100	Chicken (Gallus domesticus)	0/400/600/800/1000	mg/kg diet	no	NR	FD	20	day	2	weeks	JV	male	WO		400	No	0.46	yes	1.10E-02		9.57	Pritzl et al, 1974
Cadmium chloride	100	Chicken (*Gallus domesticus*)	0/75	mg/kg diet	no	NR	FD	2	weeks	1	days	JV	male	WO		75.0	yes	0.1	no	1.30E-02		9.75	Freeland and Cousins, 1973
Cadmium chloride	100	Japanese Quail (*Coturnix japonica*)	0/75	mg/kg diet	no	NR	FD	4	weeks	1	days	JV	both	WO		75.0	yes	0.053	no	8.60E-03		12.2	Richardson et al, 1974
Cadmium chloride	100	Japanese Quail (*Coturnix japonica*)	0/75	mg/kg diet	no	NR	FD	4	weeks	1	days	JV	both	WO		75.0	yes	0.0461	no	7.85E-03		12.8	Richardson and Fox, 1974
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/100	mg/kg diet	no	NR	FD	3	weeks	1	days	JV	NR	WO		100	yes	0.1	no	1.30E-02		13.0	Rama and Planas, 1981
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/100	mg/kg diet	no	NR	FD	1	weeks	1	days	JV	female	WO		100	No	0.084	no	1.16E-02		13.8	Hill, 1980
Cadmium chloride	100	Japanese Quail (*Coturnix japonica*)	0/75	mg/kg diet	no	NR	FD	2	weeks	1	days	JV	NR	WO		75.0	yes	0.031	no	6.06E-03		14.7	Spivey et al, 1971
Survival																							
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/25/75	mg/kg diet	no	NR	FD	12	weeks	14	days	JV	male	WO	75.0		yes	2.925	no	1.17E-01	3.00		Bokori et al, 1996
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/10/20/40	mg/kg diet	no	NR	FD	3	weeks	1	days	JV	NR	WO	40.0		yes	0.18	no	1.91E-02	4.24		Blalock and Hill, 1988
Cadmium chloride	100	Wood duck (*Aix sponsa*)	0/2.18/7.61/77.85	mg/kg diet	no	NR	FD	12	weeks	1	weeks	JV	both	WO	77.85		yes	0.4988	no	3.70E-02	5.78		Mayack et al, 1981
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/20/40/60/80/100	mg/kg diet	no	NR	FD	5	weeks	1	days	JV	both	WO	100		No	0.328	no	2.82E-02	8.59		Hill, 1974
Cadmium carbonate	100	Chicken (Gallus domesticus)	0/400/600/800/1000	mg/kg diet	no	NR	FD	20	day	2	weeks	JV	male	WO	400	600	No	0.46	yes	1.10E-02	9.57	14.3	Pritzl et al, 1974
Cadmium chloride	100	Japanese Quail (*Coturnix japonica*)	0/75	mg/kg diet	no	NR	FD	4	weeks	1	days	JV	both	WO	75.0		yes	0.064	no	9.72E-03	10.5		Richardson et al, 1974
Cadmium sulfate	100	Duck (*Anas sp* .)	0/100	mg/kg diet	no	NR	FD	15	day	NR	NR	JV	male	WO	100		No	0.092	no	1.23E-02	13.4		Van Vleet et al, 1981
Cadmium chloride	100	Japanese Quail (*Coturnix japonica*)	0/75	mg/kg diet	no	NR	FD	2	weeks	1	days	JV	NR	WO	75.0		yes	0.034	no	6.44E-03	14.2		Spivey et al, 1971
Cadmium sulfate	100	Japanese Quail (*Coturnix japonica*)	0/75/150/300	mg/kg diet	no	NR	FD	37	day	NR	NR	SM	female	WO	150	300	yes	0.2	no	2.04E-02	15.3	30.6	Bokori, et al, 1995
Cadmium chloride	100	Mallard Duck (*Anas platyrhychos*)	0/1.6/15.2/210	mg/kg diet	yes	10	FD	90	day	1	years	AD	both	WO	210		yes	1.153	yes	8.80E-02	16.9		White and Finley, 1978
Cadmium chloride	100	Mallard (*Anas platyrhynchos*)	0/1.6/15.2/210	mg/kg diet	yes	10	FD	90	day	1	years	AD	both	WO	210		yes	1.153	yes	1.10E-01	21.1		White et al 1978
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/75/300/600	mg/kg diet	no	NR	FD	4	weeks	21	days	JV	male	WO	300	600	yes	0.496	no	3.69E-02	22.3	44.6	Bokori et al, 1995

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Cadmium sulfate	100	Chicken (*Gallus domesticus*)	0/57	mg/kg diet	no	NR	FD	2	weeks	1	days	JV	both	WO		57.0	No	0.328	no	2.82E-02		4.90	Hill, 1974
Cadmium sulfate	100	Duck (*Anas sp* .)	0/500	mg/kg diet	no	NR	FD	28	day	NR	NR	JV	male	WO		500	No	0.092	no	1.23E-02		66.9	Van Vleet et al, 1981
Chlordane (pesticide)																							
Survival																							
Chlordane		Red-winged Blackbird (*Agelaius phoeniceus*	10/50/100	ppm	no	NR	FD	84	day	NR	NR	AD	NR	WO	10		yes	0.064	yes	1.37E-02	2.14	10.7	Stickel et al, 1983
Chromium +3																							
Reproduction																							
Chromium chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/5	mg/kg diet	no	na	FD	4	weeks	NR	NR	LB	female	WO	5		yes	1.775	no	8.50E-02	0.238		Jensen and Maurice, 1980
Chromium chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/10	ug/g diet	no	na	FD	12	weeks	40	weeks	LB	female	WO	10		yes	1.70	no	8.23E-02	0.483		Maurice and Jensen, 1979
Chromium chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/10	mg/kg diet	no	na	FD	4	weeks	NR	NR	LB	female	WO	10		No	1.6	no	7.90E-02	0.494		Jensen and Maurice, 1980
Chrome alum doceahydrate	100	Black duck (*Anas rubripes*)	0/10/50	mg/kg diet	yes	1	FD	180 -190	day	NR	NR	LB	female	WO	10	50	yes	1.17	no	6.19E-02	0.569	2.84	Haseltine et al., unpublished
Chromium chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/10	mg/kg diet	no	na	FD	8	weeks	40	weeks	LB	female	WO	10		No	1.6	yes	1.19E-01	0.744		Sauveur and Thapon, 1983
Chromium chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	no	na	FD	6	day	50	weeks	LB	female	EGG-SL	20		No	1.60	no	7.90E-02	0.988		Ousterhout and Berg, 1981
Chromium chloride	100	Chicken (*Gallus domesticus*)	0/500/1000/2000	mg/kg diet	no	na	FD	15	day	22	weeks	LB	female	EGG	500	1000	No	1.6	yes	1.36E-01	37.7	75.4	Meluzzi et al., 1996

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Growth																							
Chromium chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/10	ug/g diet	no	na	FD	12	weeks	40	weeks	SM	S	WO	10		yes	1.70	no	8.23E-02	0.483		Maurice and Jensen, 1979
Chromium chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	no	na	FD	21	day	1	days	JV	male	WO	20		yes	0.534	no	3.87E-02	1.45		Cupo and Donaldson, 1987
Chromium chloride hexahydrate	100	Turkey (*Meleagris gallopavo*)	0/20/40/80	mg/kg diet	no	na	FD	14	day	1	weeks	JV	both	WO	80		yes	0.398	no	3.19E-02	6.42		Steele and Rosebrough, 1979
Chromium chloride	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO	1000		No	0.328	no	2.82E-02	85.9		Hill, 1974
Chromium chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/1000/2000	mg/kg diet	no	na	FD	4	weeks	1	days	AD	male	WO	2000		No	1.04	no	5.98E-02	359		Hafez and Kratzer, 1976
Chomium in yeast	100	Chicken (*Gallus domesticus*)	0/200/400	mg/kg diet	no	na	FD	35	day	7	days	JV	female	WO		200	yes	2.08	yes	1.03E-01		9.91	Motozono et al., 1998
Chromium acetate	100	Chicken (*Gallus domesticus*)	0/500	ug/g diet	no	na	FD	4	weeks	1	days	JV	male	WO		500	yes	1.044	no	5.99E-02		28.7	Nielsen et al, 1980
Survival																							
Chromium yeast	100	Chicken (*Gallus domesticus*)	0/400	ug/kg diet	no	na	FD	19	day	28	days	JV	both	WO	400		yes	2.33	yes	1.44E-01	0.0248		Hossain et al, 1998
Chrome alum doceahydrate	100	Black duck (*Anas rubripes*)	0/10/50	mg/kg diet	yes	1	FD	10	m	NR	NR	MA	male	WO	10	50	yes	1.17	no	6.40E-02	0.557	2.78	Haseltine et al., unpublished
Chromium chloride	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no	na	FD	5	weeks	1	days	JV	both	NR	1000		No	0.328	no	2.82E-02	85.9		Hill, 1974
Chromium chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/1000/2000	mg/kg diet	no	na	FD	4	weeks	1	days	AD	male	WO	2000		No	1.04	no	5.98E-02	359		Hafez and Kratzer, 1976
Chromium +6																							
Reproduction																							
Sodium chromate	100	Chicken (*Gallus domesticus*)	0/40.9	ug/org/d	no	na	FD	1	years	1	days	JV	male	GO	40.9		yes	1.708	no	8.20E-02	0.0240		Rao et al, 1983
Potassium chromate	100	Chicken (*Gallus domesticus*)	0/5	mg/kg diet	no	na	FD	4	weeks	NR	NR	LB	female	WO	5.0		No	1.740	no	8.30E-02	0.240		Jensen and Maurice, 1980
Potassium dichromate	35.35	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	na	FD	32	weeks	1	days	JV	both	EGG		250	yes	2.02	no	9.20E-02		4.02	Asmatullah et al, 1999
Growth																							
Sodium chromate	100	Chicken (*Gallus domesticus*)	0/40.9	ug/org/d	no	na	FD	1	years	1	days	JV	male	WO	40.9		yes	1.708	no	8.20E-02	0.0240		Rao et al, 1983
Sodium dichromate	100	Chicken (*Gallus domesticus*)	0/30/100	mg/kg diet	no	na	FD	21	day	11	days	JV	male	WO	100		No	0.328	no	2.82E-02	8.59		Romoser et al., 1961
Potassium dichromate	35.35	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	na	FD	32	weeks	1	days	JV	both	WO		250	yes	2.02	no	9.20E-02		4.02	Asmatullah et al, 1999
Survival																							
Sodium dichromate	100	Chicken (*Gallus domesticus*)	0/30/100	mg/kg diet	no	na	FD	21	day	11	days	JV	male	WO	100		No	0.328	no	2.82E-02	8.59		Romoser et al., 1961
Cobalt																							
Growth																							
Cobalt chloride	4539	Chicken (*Gallus domesticus*)	0/100/200/300	mg/kg			FD	5	weeks	1	days	JV	female	WO	100	200	No	0.328	no	2.80E-02	3.89	7.80	Hill, 1979
Cobalt	100	Chicken (*Gallus domesticus*)	0/50/100/200	mg/kg			FD	3	weeks	1	days	JV	male	WO	50	100	yes	0.3738	no	3.00E-02	4.10	8.20	Ling et al., 1979
Cobalt chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/50/100/200/300/400	mg/kg			FD	2	weeks	1	days	JV	both	WO	50	100	yes	0.328	no	3.10E-04	4.29	8.59	Hill, 1974
Cobalt chloride hexahydrate	100	Duck (*Anas sp.*)	0/0.02/0.2	% in diet			FD	8	day	2	days	JV	NR	WO	0.02	0.2	yes	0.5	yes	3.70E-02	14.8	148	Paulov, 1971
Cobalt carbonate	100	Chicken (*Gallus domesticus*)	0/100/200	mg/kg			FD	2	weeks	1	days	JV	both	WO	200		yes	0.109	no	1.40E-02	25.2		Berq and Martinson, 1972
Cobolt chloride	100	Chicken (*Gallus domesticus*)	0/200	mg/kg			FD	2	weeks	1	days	JV	both	WO		200	No	0.328	no	2.80E-02		17.0	Hill, 1979
Cobalt chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/116/251/472	mg/kg			FD	14	day	1	days	JV	male	WO		116	yes	0.2532	yes	2.70E-02		12.0	Diaz at al., 1994
Cobalt chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg			FD	14	day	0	days	IM	male	WO		250	No	0.328	no	2.80E-02		21.5	Brown and Southern, 1985
Cobalt chloride heptahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	ug/g			FD	15	day	8	days	JV	male	WO		250	yes	0.296	no	2.60E-02		22.3	Southern and Baker, 1981
Cobalt chloride hexahydrate	24.9	Chicken (*Gallus domesticus*)	0/500	mg/kg			FD	14	day	1	days	JV	both	WO		500	yes	0.2532	yes	3.80E-02		29.5	Diaz at al., 1994
Survival																							
Cobalt chloride hexahydrate	24.9	Chicken (*Gallus domesticus*)	0/500	mg/kg			FD	42	day	1	days	JV	both	WO	500		yes	1.6255	yes	5.90E-02	4.59		Diaz at al., 1994
Cobalt chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/50/100/200/300/400	mg/kg			FD	5	weeks	1	days	JV	both	WO	100	200	No	1.042	no	6.00E-02	5.74	11.5	Hill, 1974
Cobalt chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/116/251/472	mg/kg			FD	14	day	1	days	JV	male	WO	116	251	yes	0.2532	yes	2.70E-02	12.3	26.7	Diaz at al., 1994
Cobolt chloride	100	Chicken (*Gallus domesticus*)	0/200	mg/kg			FD	2	weeks	1	days	JV	both	WO	200		No	0.328	no	2.80E-02	17.0		Hill, 1979
Cobalt chloride hexahydrate	100	Duck (*Anas sp.*)	0/200	mg/kg			FD	15	day	1	days	JV	male	WO	200		No	0.46	no	3.50E-02	15.0		Van Vleet et al, 1981
Cobalt	100	Chicken (*Gallus domesticus*)	0/50/100/200	mg/kg			FD	3	weeks	1	days	JV	male	WO	200		yes	0.1662	no	1.80E-02	22.0		Ling et al., 1979
Cobalt chloride hexahydrate	100	Duck (*Anas sp.*)	0/200	mg/kg			FD	28	day	1	days	JV	male	WO		500	No	0.46	no	3.50E-02		38.0	Van Vleet et al, 1981
Copper																							
Reproduction																							
Copper	100	Chicken (*Gallus domesticus*)	0/50/150/250	mg/kg diet	no	N	FD	84	day	25	weeks	LB	female	WO	50	150	yes	1.5161	yes	1.23E-01	4.05	12.1	Ankari et al, 1998
Copper sulfate - anhydrous	100	Chicken (*Gallus domesticus*)	0/22.3/31.2	mg/org/d	no	N	FD	6	weeks	64	weeks	LB	female	WO	22.3	31.2	No	1.6	yes	9.99E-02	13.9	19.5	Harms and Buresh 1986
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	280	day	18	weeks	LB	female	EGG	300	450	yes	2.16	yes	1.12E-01	15.6	23.3	Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	LB	female	WO	300	450	yes	2.03	yes	1.15E-01	17.0	25.5	Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/25.8/40.0/45.0	mg/org/d	no	N	FD	5	day	27	weeks	LB	female	WO	25.8	40	yes	1.43	yes	1.03E-01	18.0	28.0	Stevenson et al, 1983
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	280	day	18	weeks	LB	female	EGG	300	450	yes	1.5	yes	9.68E-02	19.4	29.0	Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	LB	female	WO	300	450	yes	1.6	yes	1.09E-01	20.5	30.7	Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/10.39/21.31/31.52/39.91	mg/org/d	no	N	FD	336	day	17	weeks	LB	female	WO	39.9		yes	1.85	yes	9.97E-02	21.6		Jackson, et. al., 1979
Copper (II) sulfate	39.81	Chicken (*Gallus domesticus*)	0/0.1/0.2/0.3/0.4	% in diet	no	N	FD	2	weeks	7	months	LB	female	EGG	0.1	0.2	No	1.6	yes	9.00E-02	22.4	44.8	Griminger 1977
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500/1000/2000	mg/kg diet	no	N	FD	12	day	26	weeks	LB	female	WO	500	1000	No	1.6	yes	7.20E-02	22.5	45.0	Pearce et al 1983
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/23.5/43.84/56.47/60.43	mg/org/d	no	N	FD	232	day	17	weeks	LB	female	WO	43.8	56.47	yes	1.886	yes	1.10E-01	23.2	29.9	Jackson, et. al., 1979
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/440	mg/kg diet	no	N	FD	6	weeks	24	weeks	LB	female	WO	440		yes	1.4	yes	7.62E-02	23.9		Stevenson and Jackson 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500/1000/2000	mg/kg diet	no	N	FD	6	day	24	weeks	LB	female	WO	500	1000	No	1.6	yes	8.70E-02	27.2	54.4	Stevenson and Jackson 1980
Copper (II) sulfate	100	Chicken (*Gallus domesticus*)	0/195/405/598/758	ug/g diet	no	N	FD	4	weeks	28	weeks	LB	female	WO	405	598	yes	1.427	yes	9.70E-02	27.5	40.6	Chiou et al, 1997
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/0.01486/0.02857/0.04828/0.0788 6/0.08657	g/org/d	no	N	FD	35	day	NR	NR	LB	female	WO	0.0483	0.079	yes	1.66	yes	1.01E-02	29.1	47.5	Jackson, 1977
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/920	mg/kg diet	no	N	FD	6	weeks	24	weeks	LB	female	WO	920		yes	1.41	yes	4.67E-02	30.4		Stevenson and Jackson 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/400/500/600	mg/kg diet	no	N	FD	4	weeks	38	weeks	LB	female	WO	500	600	yes	1.464	yes	9.78E-02	33.4	40.1	Chiou et al, 1998
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/1830	mg/kg diet	no	N	FD	6	weeks	24	weeks	LB	female	WO	1830		yes	1.41	yes	2.71E-02	35.2		Stevenson and Jackson 1981
Copper oxide	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	LB	female	OV	600	750	yes	1.77	yes	1.18E-01	40.0	50.0	Jackson and Stevenson, 1981
Copper oxide	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	LB	female	WO	750		yes	2.13	yes	1.23E-01	43.3		Jackson and Stevenson, 1981
Copper (II) sulfate	39.81	Chicken (*Gallus domesticus*)	0/200/600/800/1200/1600	mg/kg bw	no	N	OR	3	weeks	25	weeks	JV	male	TE	600	800	yes	1.7	no	8.22E-02	239	318	Shivanandappa et al., 1983
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/0.05	% in diet	no	N	FD	28	weeks	12	weeks	LB	female	EGG-WO		0.05	yes	1.4976	yes	5.91E-02		19.7	Kadirvel and Kothandaraman, 1978
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500/1000/2000	mg/kg diet	no	N	FD	8	weeks	24	weeks	LB	female	WO		500	No	1.6	yes	7.23E-02		22.6	Stevenson and Jackson 1980
Copper oxychloride	59.51	Chicken (*Gallus domesticus*)	0/900/1200/1500/1800	mg/kg bw	no	N	OR	3	weeks	25	weeks	JV	male	TE		900	yes	1.7	no	8.22E-02		536	Shivanandappa et al., 1983
Growth																							
Copper sulfate	25	Chicken (*Gallus domesticus*)	0/75/150	mg/kg diet	no	N	FD	6	weeks	1	days	JV	male	WO	150		yes	1.1273	yes	5.79E-02	1.92		Hoda and Maha, 1995
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/60/120/240	mg/kg diet	no	N	FD	8	weeks	1	days	JV	male	WO	60	120	yes	3.14	no	1.23E-01	2.34	4.68	Kashani et al., 1986
Cupric citrate	100	Chicken (*Gallus domesticus*)	0/63	mg/kg diet	no	N	FD	42	day	1	days	JV	male	WO	63		No	2.393	no	1.03E-01	2.70		Pesti and Bakalli 1996

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/32	mg/kg diet	no	N	FD	2	weeks	1	days	JV	both	WO	32		No	0.328	no	2.82E-02	2.75		Hill, 1974
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/120	mg/kg diet	no	N	FD	24	weeks	1	days	JV	male	WO	120		yes	11.61	no	2.87E-01	2.97		Guenthner et al, 1978
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/20/40/80/160	mg/kg diet	no	N	FD	4	weeks	NR	NR	JV	NR	WO	40	80	yes	0.2393	no	2.29E-02	3.83	7.67	McGhee et al, 1965
copper sulfate pentahydrate	100	Duck (*Anas platyrhynchos*)	0/100	mg/kg diet	no	N	FD	56	day	8	days	JV	both	WO	100		No	2.644	no	1.10E-01	4.15		King, 1975
Cupric citrate	100	Chicken (*Gallus domesticus*)	0/50/75/100	mg/kg diet	no	N	FD	42	day	1	days	JV	male	WO	100		No	2.19	no	9.70E-02	4.43		Pesti and Bakalli 1996
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/100	mg/kg diet	no	N	FD	9	weeks	1	days	JV	both	WO	100		No	1.8966	no	8.83E-02	4.65		King, 1972
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/8/75	mg/kg diet	no	N	FD	4	weeks	NR	NR	JV	NR	WO	75		yes	0.787	no	4.98E-02	4.75		Kayongo-Male and Palmer, 1998
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/125	mg/kg diet	no	N	FD	42	day	1	days	JV	male	WO	125		No	2.309	no	1.00E-01	5.43		Pesti and Bakalli 1996
Cupric citrate	100	Chicken (*Gallus domesticus*)	0/63/125	mg/kg diet	no	N	FD	42	day	1	days	JV	male	WO	125		No	2.155	no	9.59E-02	5.56		Pesti and Bakalli 1996
Cupric carbonate	100	Turkey (*Melagris gallopavo*)	0/100/800	mg/kg diet	no	N	FD	3	weeks	7	days	JV	NR	WO	100	800	No	1	no	5.82E-02	5.82	46.6	Waibel et al, 1964
Copper oxide	80.0	Chicken (*Gallus domesticus*)	0/75/150	mg/kg diet	no	N	FD	6	weeks	1	days	JV	NR	WO	150		yes	1.0887	yes	5.70E-02	6.28		Hoda and Maha, 1995
Copper carbonate	100	Chicken (*Gallus domesticus*)	0/75/150	mg/kg diet	no	N	FD	6	weeks	1	days	JV	NR	WO	150		yes	1.2283	yes	6.19E-02	7.55		Hoda and Maha, 1995
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/100	mg/kg diet	no	N	FD	2	weeks	1	days	JV	both	WI	100		No	0.46	no	3.51E-02	7.63		Hill, 1974
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/187	mg/kg diet	no	N	FD	42	day	1	days	JV	male	WO	187		No	2.26	no	9.90E-02	8.19		Pesti and Bakalli 1996
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/54/94/134	mg/kg diet	no	N	FD	3	weeks	3	days	JV	male	WO	134		yes	0.6283	yes	3.94E-02	8.40		Ko et al, 1985
Copper carbonate	100	Chicken (*Gallus domesticus*)	0/100/500/1000	mg/kg diet	no	N	FD	7	day	6	days	JV	NR	WO	100	500	No	0.328	no	2.82E-02	8.59	42.9	Ekperigin and Vohra 1981
Copper chloride dihydrate	100	Chicken (*Gallus domesticus*)	0/100/500/1000	mg/kg diet	no	N	FD	7	day	7	days	JV	NR	WO	100	500	No	0.328	no	2.82E-02	8.59	42.9	Ekperigin and Vohra 1981
Copper (II) sulfate	39.81	Chicken (*Gallus domesticus*)	0/0.05/0.1/0.5	% in diet	no	N	FD	3	weeks	4	weeks	JV	male	WO	0.05	0.1	yes	0.292	yes	1.40E-02	9.52	19.0	Gill et al, 1995
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/208	mg/kg diet	no	N	FD	38	day	1	days	JV	both	WO	208		yes	1.876	no	8.77E-02	9.72		Skrivan et al, 2000
Copper sulfate pentahydrate	100	Duck (*Anas platyrhynchos*)	0/2.1/9.9/50.15/250.85	mg/L	no	N	DR	14	day	4	days	JV	NR	WO	9.9	50.15	yes	0.2379	yes	2.45E-01	10.2	51.6	Foster, 1999
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/125/250	mg/kg diet	no	N	FD	42	day	1	days	JV	male	WO	250		No	2.148	no	9.57E-02	11.1		Pesti and Bakalli 1996
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	42	day	21	days	JV	male	WO	250		No	1.963	no	9.03E-02	11.5		Pesti and Bakalli 1996
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/63/125/185/250	mg/kg diet	no	N	FD	35	day	1	days	JV	male	WO	250		No	1.789	no	8.50E-02	11.9		Pesti and Bakalli 1996
Copper carbonate	51.43	Chicken (*Gallus domesticus*)	0/0.05/0.10	% in diet	no	N	FD	4	weeks	3	days	JV	NR	WO	0.05	0.1	No	1.042	yes	4.92E-02	12.2	24.3	Nam et al 1984
Copper sulfate pentahydrate	100	Duck (*Anas platyrhynchos*)	0/52.4	mg/L	no	N	DR	14	day	4	days	JV	NR	WO	52.4		yes	0.2594	yes	6.23E-02	12.6		Foster, 1999
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/100/250/500	mg/kg diet	no	N	FD	3	weeks	3	weeks	JV	NR	WO	250	500	yes	1.945	yes	1.14E-01	13.3	26.6	Chiou et al, 1999
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/229	mg/kg diet	no	N	FD	6	weeks	1	days	JV	both	WO	229		yes	0.986	no	5.77E-02	13.4		Jenkins et al, 1970
Copper (II) sulfate	39.81	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	21	day	7	days	JV	male	WO	250		No	0.564	yes	8.02E-02	14.2		Marron, et al, 2001
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/25/50/100/200	mg/kg diet	no	N	FD	19	day	1	days	JV	female	WO	200		No	0.564	no	4.01E-02	14.2		Hill, 1990
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250	500	No	1.042	no	5.98E-02	14.3	28.7	Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/125/250/500/1000	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250	500	No	1.042	no	5.98E-02	14.3	28.7	Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250	500	No	1.042	no	5.98E-02	14.3	28.7	Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500/750/1000	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250	500	No	1.042	no	5.98E-02	14.3	28.7	Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250	500	No	1.042	no	5.98E-02	14.3	28.7	Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250		No	1.042	no	5.98E-02	14.3		Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250		No	1.042	no	5.98E-02	14.3		Poupoulis and Jensen 1976
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	41	day	1	days	JV	male	WO	250		No	1.042	no	5.98E-02	14.3		Bakalli et al, 1995
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/5/8.23	mg/org/d	no	N	FD	14	day	8	days	JV	male	WO	5	8.23	yes	0.319	yes	2.50E-02	15.7	25.8	Funk and Baker 1991
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/200/400/600	mg/kg diet	no	N	FD	42	day	1	days	JV	both	WO	400	600	yes	1.986	yes	8.18E-02	16.5	24.7	Miles et al 1998
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500/1000/2000	mg/kg diet	no	N	FD	6	day	24	weeks	SM	female	WO	250	500	No	1.6	yes	1.07E-01	16.7	33.4	Stevenson and Jackson 1980
Tribasic copper chloride	100	Chicken (*Gallus domesticus*)	0/200/400/600	mg/kg diet	no	N	FD	42	day	1	days	JV	both	WO	400	600	yes	1.966	yes	8.45E-02	17.2	25.8	Miles et al 1998
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/125/250/375	mg/kg diet	no	N	FD	42	day	1	days	JV	male	WO	375		No	1.884	no	8.79E-02	17.5		Pesti and Bakalli 1996
Cupric sulfate	100	Chicken (*Gallus domesticus*)	0/100/200/350	mg/kg diet	no	N	FD	25	day	1	days	JV	male	WO	200	350	yes	0.2982	no	2.65E-02	17.8	31.1	Smith 1969
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/125/250/500	mg/kg diet	no	N	FD	3	weeks	1	days	JV	male	WO	250	500	No	0.564	no	4.01E-02	17.8	35.5	Wang et al 1987
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/25.8/40.0/45.0	mg/org/d	no	N	FD	5	day	27	weeks	SM	female	WO	25.8	40	yes	1.43	yes	1.03E-01	18.0	28.0	Stevenson et al, 1983
Copper carbonate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	3	weeks	1	days	JV	NR	WO	250		yes	0.53	no	3.85E-02	18.2		Jensen and Maurice 1978
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/6.34	mg/org/d	no	N	FD	10	day	5	days	JV	male	WO	6.34		yes	0.3465	yes	1.16E-01	18.3		Ward et al, 1995
Copper chloride	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	3	weeks	1	days	JV	NR	WO	250		yes	0.516	no	3.78E-02	18.3		Jensen and Maurice 1978
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	3	weeks	1	days	JV	NR	WO	250		yes	0.513	no	3.77E-02	18.4		Jensen and Maurice 1978
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500/750	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250	500	yes	0.5	no	3.71E-02	18.5	37.1	Jensen and Maurice 1979
Copper oxide	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	3	weeks	1	days	JV	NR	WO	250		yes	0.496	no	3.69E-02	18.6		Jensen and Maurice 1978
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/2.49/4.71/7.33/8.42	mg/org/d	no	N	FD	14	day	8	days	JV	male	WO	4.71	7.33	yes	0.24	yes	1.83E-02	19.6	30.5	Funk and Baker 1991
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/0.05	% in diet	no	N	FD	28	weeks	12	weeks	SM	female	WO	0.05		yes	1.4976	yes	5.91E-02	19.7		Kadirvel and Kothandaraman, 1978
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	SM	female	WO	300	450	yes	1.6	yes	1.09E-01	20.5	30.7	Jackson and Stevenson, 1981
Copper	100	Chicken (*Gallus domesticus*)	0/211.6	mg/kg diet	no	N	FD	3	weeks	1	days	JV	both	WO	211.6		yes	0.1103	yes	1.09E-02	20.9		Pimentel et al, 1992
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	14	day	8	days	JV	NR	WO	250	500	yes	0.334	no	2.85E-02	21.3	42.7	Robbins and Baker 1980
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/100/250/500/1000	mg/kg diet	no	N	FD	7	day	9	days	JV	NR	WO	250	500	No	0.328	no	2.82E-02	21.5	42.9	Ekperigin and Vohra 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	8	day	9	days	JV	NR	WO	250		No	0.328	no	2.82E-02	21.5		Ekperigin and Vohra 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/10.39/21.31/31.52/39.91	mg/org/d	no	N	FD	336	day	17	weeks	SM	female	WO	39.91		No	1.85	yes	9.97E-02	21.6		Jackson, et. al., 1979
Copper	100	Chicken (*Gallus domesticus*)	0/118/191/259/264	mg/kg diet	no	N	FD	2	weeks	1	days	JV	male	WO	264		yes	0.374	no	3.07E-02	21.7		Wideman et al 1996
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/175/341/529	mg/kg diet	no	N	FD	21	day	1	days	JV	both	WO	341	529	yes	0.568	yes	3.65E-02	21.9	34.0	Miles et al 1998
Copper (II) sulfate	39.81	Chicken (*Gallus domesticus*)	0/0.1/0.2/0.3/0.4	% in diet	no	N	FD	2	weeks	7	months	SM	female	WO	0.1	0.2	No	1.6	yes	9.00E-02	22.4	44.8	Griminger 1977
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/125/250/375	mg/kg diet	no	N	FD	3	weeks	1	days	JV	male	WO	250	375	No	0.564	yes	5.13E-02	22.7	34.1	Kassim and Suwanpradit, 1996
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	280	day	18	weeks	SM	female	WO	450	600	yes	1.62	yes	8.29E-02	23.0	30.7	Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/23.5/43.84/56.47/60.43	mg/org/d	no	N	FD	232	day	17	weeks	SM	female	WO	43.84	56.47	yes	1.886	yes	1.10E-01	23.2	29.9	Jackson, et. al., 1979
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	SM	female	WO	450	600	yes	1.96	yes	1.01E-01	23.3	31.0	Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/440	mg/kg diet	no	N	FD	6	weeks	24	weeks	SM	female	WO	440		yes	1.4	yes	7.62E-02	23.9		Stevenson and Jackson 1981
Copper chloride dihydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	500		No	1.6	no	7.90E-02	24.7		Poupoulis and Jensen 1976
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	280	day	18	weeks	SM	female	WO	450	600	yes	1.91	yes	8.53E-02	26.4	35.2	Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/10.33	mg/org/d	no	N	DR	10	day	5	days	JV	male	WO	10.33		yes	0.389	yes	1.16E-01	26.6		Ward et al, 1995
Copper acetate monohydrate	100	Chicken (*Gallus domesticus*)	0/100/200/300	mg/kg diet	no	N	FD	3	weeks	1	days	JV	male	WO	200	300	No	0.564	yes	7.59E-02	26.9	40.4	Ledoux et al, 1989
Copper (II) sulfate	100	Chicken (*Gallus domesticus*)	0/195/405/598/758	ug/g diet	no	N	FD	28	day	28	weeks	SM	female	WO	598	758	yes	1.395	yes	6.50E-02	27.9	35.3	Chiou et al, 1997
Copper	100	Chicken (*Gallus domesticus*)	0/100/200/400	mg/kg diet	no	N	FD	19	day	NR	NR	JV	NR	WO	400		No	0.564	no	4.01E-02	28.4		Hill, 1989
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500/1000	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	500	1000	No	1.042	no	5.98E-02	28.7	57.4	Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	500		No	1.042	no	5.98E-02	28.7		Poupoulis and Jensen 1976

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Tribasic copper chloride	100	Chicken (*Gallus domesticus*)	0/161/305/468	mg/kg diet	no	N	FD	21	day	1	days	JV	both	WO	468		yes	0.619	yes	3.91E-02	29.5		Miles et al 1998
Copper sulfate pentahydrate	100	Turkey (*Melagris gallopavo*)	0/400/800	mg/kg diet	no	N	FD	21	day	NR	NR	JV	both	WO	400	800	No	0.5	no	3.71E-02	29.7	59.3	Vohra and Kratzer, 1968
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/100/200/400	mg/kg diet	no	N	FD	19	day	1	days	JV	female	WO	400		No	0.564	no	4.29E-02	30.4		Hill, 1990
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/920	mg/kg diet	no	N	FD	6	weeks	24	weeks	JV	female	WO	920		yes	1.4	yes	4.67E-02	30.7		Stevenson and Jackson 1981
Copper oxide	100	Chicken (*Gallus domesticus*)	0/403/570/749/1180	mg/kg diet	no	N	FD	10	weeks	1	days	JV	both	WO	570	749	yes	1.0166	no	5.88E-02	33.0	43.3	Mehring et al, 1960
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/120/240/480	mg/kg diet	no	N	FD	3	weeks	1	days	JV	male	WO	480		yes	0.567	no	4.02E-02	34.1		Jensen et al, 1991
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/500/750	mg/kg diet	no	N	FD	21	day	1	days	JV	both	WO	500	750	yes	0.3217	yes	2.23E-02	34.6	51.9	Harms and Buresh 1987
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/2.67/5.22/10.36/18.79	mg/org/d	no	N	FD	14	day	8	days	JV	male	WO	10.36	18.79	yes	0.294	yes	2.35E-02	35.2	63.9	Funk and Baker 1991
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	14	day	8	days	JV	male	WO	500		No	0.564	no	4.01E-02	35.5		Bafundo et al, 1984
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	19	day	1	days	JV	female	WO	500		No	0.564	no	4.01E-02	35.5		Hill, 1990
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/5.78/11.51	mg/org/d	no	N	FD	14	day	8	days	JV	male	WO	11.51		yes	0.317	yes	2.89E-02	36.3		Funk and Baker 1991
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	500		yes	0.519	no	3.80E-02	36.6		Jensen and Maurice 1979
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	21	day	14	days	JV	male	WO	500		yes	0.484	yes	3.59E-02	37.1		Davis et al, 1996
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/400/500/600	mg/kg diet	no	N	FD	4	weeks	38	weeks	SM	female	WO	600		yes	1.464	yes	9.78E-02	40.1		Chiou et al, 1998
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	14	day	8	days	JV	male	WO	500		yes	0.374	no	3.07E-02	41.0		Southern and Baker, 1983
Copper oxide	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	SM	female	WO	750		yes	2.13	yes	1.23E-01	43.3		Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/125/250/375	mg/kg diet	no	N	FD	3	weeks	3	weeks	JV	male	WO	250	375	No	0.564	yes	1.12E-01	49.5	74.2	Kassim and Suwanpradit, 1996
Copper oxide	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	SM	female	WO	750		yes	1.77	yes	1.18E-01	50.0		Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Turkey (*Melagris gallopavo*)	0/338/676	mg/kg diet	no	N	FD	21	day	NR	NR	JV	both	WO	676		No	0.5	no	3.71E-02	50.1		Vohra and Kratzer, 1968
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/0.01486/0.02857/0.04828/0.0788 6/0.08657	g/org/d	no	N	FD	35	day	1	years	SM	female	WO	0.0789	0.087	yes	1.55	yes	8.20E-02	50.9	55.9	Jackson, 1977
Copper sulfate pentahydrate	100	Duck (*Anas platyrhynchos*)	0/218.5/420/1024	mg/kg diet	no	N	FD	35	day	3	days	JV	NR	WO	218.5	420	yes	0.8	yes	2.08E-01	56.8	109	Foster, 1999
Copper sulfate pentahydrate	100	Turkey (*Melagris gallopavo*)	0/810/1620/2430/3240	mg/kg diet	no	N	FD	21	day	NR	NR	JV	both	WO	810	1620	No	0.5	no	3.71E-02	60.0	120	Vohra and Kratzer, 1968
Copper sulfate pentahydrate	100	Japanese quail (*Coturnix japonica*)	0/200/400/600	mg/kg diet	no	N	FD	34	day	7	days	JV	both	WO	600		yes	0.1764	yes	2.41E-02	82.0		Yannakopoulos et al., 1990
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/20/40/80	mg/kg diet	no	N	FD	21	day	1	days	JV	male	WO	80		No	0.564	yes	7.27E-01	103		Leeson and Summers, 1982
Cupric acetate monohydrate	100	Duck (*Anas platyrhynchos*)	0/1024.8	mg/kg diet	no	N	FD	35	day	3	days	JV	NR	WO	1024.8		yes	0.9584	yes	1.34E-01	143		Foster, 1999
Copper carbonate	100	Chicken (*Gallus domesticus*)	0/42/76/98	mg/kg diet	no	N	FD	3	weeks	3	days	JV	male	WO		42	yes	0.2039	yes	1.30E-02		2.69	Ko et al, 1985
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/120	mg/kg diet	no	N	FD	8	weeks	1	days	JV	male	WO		120	yes	2.8	no	1.14E-01		4.88	Kashani et al., 1986
Copper (II) sulfate pentahydrate	25.45	Turkey (*Meleagris gallopavo*)	0/0.05	% in diet	no	N	FD	3	weeks	1	days	JV	NR	WO		0.05	yes	0.389	no	3.15E-02		10.3	Harms and Eberst 1974
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO		250	No	1.042	no	5.98E-02		14.3	Poupoulis and Jensen 1976
copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO		250	yes	0.591	no	4.13E-02		17.5	Jensen and Maurice 1978
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	24	day	1	days	JV	both	WO		250	yes	0.335	no	2.86E-02		21.3	Latymer and Coates, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500/1000/2000	mg/kg diet	no	N	FD	8	weeks	24	weeks	SM	female	WO		500	No	1.6	yes	7.23E-02		22.6	Stevenson and Jackson 1980
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/400/800	mg/kg diet	no	N	FD	21	day	1	days	JV	female	WO		400	No	0.564	yes	3.20E-02		22.7	Ledoux, et.al. 1987
Copper carbonate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	8	day	8	days	JV	male	WO		250	yes	0.181	no	1.91E-02		26.4	Robbins and Baker, 1980
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	8	day	8	days	JV	male	WO		250	yes	0.181	no	1.91E-02		26.4	Robbins and Baker, 1980
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	5	weeks	1	days	JV	both	WO		500	No	1.042	no	5.98E-02		28.7	Hill, 1974
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/500/750	mg/kg diet	no	N	FD	21	day	1	days	JV	both	WO		500	yes	0.365	yes	2.29E-02		31.4	Christmas and Harms, 1979
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500/750	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO		500	yes	0.592	no	4.14E-02		34.9	Jensen and Maurice 1978
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/1830	mg/kg diet	no	N	FD	6	weeks	24	weeks	JV	female	WO		1830	yes	1.41	yes	2.71E-02		35.2	Stevenson and Jackson, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500/1000	mg/kg diet	no	N	FD	1	weeks	12	days	JV	both	WO		500	No	0.564	no	4.01E-02		35.5	Ekperigin and Vohra 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	3	weeks	1	days	JV	male	WO		500	No	0.564	no	4.01E-02		35.5	Wang et al 1987
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500/1000/1500/2000/2500	mg/kg diet	no	N	FD	2	weeks	1	days	JV	both	WO		500	No	0.328	no	2.82E-02		42.9	Hill, 1974
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	12	day	8	days	JV	NR	WO		500	yes	0.211	no	2.11E-02		50.1	Robbins and Baker, 1980
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	8	day	8	days	JV	male	WO		500	yes	0.16	no	1.77E-02		55.2	Robbins and Baker, 1980
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	8	day	8	days	JV	NR	WO		500	yes	0.144	no	1.65E-02		57.2	Robbins and Baker, 1980
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	12	day	8	days	JV	NR	WO		500	yes	0.132	no	1.56E-02		59	Robbins and Baker, 1980
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/810/910/1000	mg/kg diet	no	N	FD	21	day	NR	NR	JV	both	WO		810	No	0.5	no	3.71E-02		60	Vohra and Kratzer, 1968
Copper sulfate pentahydrate	100	Duck (*Anas platyrhynchos*)	0/503.4	mg/kg diet	no	N	FD	35	day	3	days	JV	NR	WO		503.4	yes	0.8668	yes	1.30E-01		75.5	Foster, 1999
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no	N	FD	2	weeks	1	days	JV	NR	WO		1000	No	0.328	no	2.82E-02		85.9	Hill, 1979
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no	N	FD	14	day	1	days	JV	NR	WO		1000	yes	0.141	yes	1.31E-02		92.9	Jensen, 1975
Copper	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no	N	FD	1	weeks	1	days	JV	female	WO		1000	No	0.084	no	1.16E-02		138	Hill, 1980
Survival																							
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/32	mg/kg diet	no	N	FD	2	weeks	NR	NR	JV	both	WO	32		No	0.328	no	2.82E-02	2.75		Hill, 1974
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/50	mg/kg diet	no	N	FD	49	day	2	days	JV	both	WO	50		No	0.564	no	4.01E-02	3.55		Wood and Worden, 1973
Copper sulfate	100	Duck (*Anas platyrhynchos*)	0/50	mg/kg diet	no	N	FD	49	day	2	days	JV	both	WO	50		No	0.092	no	1.23E-02	6.69		Wood and Worden, 1973
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/100	mg/kg diet	no	N	FD	5	weeks	1	days	JV	both	WO	100		No	0.46	no	3.51E-02	7.63		Hill, 1974
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/20/40/80/160	mg/kg diet	no	N	FD	4	weeks	NR	NR	JV	NR	WO	80	160	yes	0.2019	no	2.05E-02	8.14	16.3	McGhee et al, 1965
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/54/94/134	mg/kg diet	no	N	FD	3	weeks	3	days	JV	male	WO	134		yes	0.6283	yes	3.94E-02	8.4		Ko et al, 1985
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/208	mg/kg diet	no	N	FD	38	day	1	days	JV	both	WO	208		yes	1.876	no	8.77E-02	9.72		Skrivan et al, 2000
Copper chloride dihydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	500		No	1.6	no	7.90E-02	11.7		Poupoulis and Jensen 1976
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/229	mg/kg diet	no	N	FD	6	weeks	1	days	JV	both	WO	229		yes	0.986	no	5.77E-02	13.4		Jenkins et al, 1970
Copper (II) sulfate	39.81	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	21	day	7	days	JV	male	WO	250		No	0.564	yes	8.02E-02	14.2		Marron, et al, 2001
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500/750/1000	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250	500	No	1.042	no	5.98E-02	14.3	28.7	Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250	500	No	1.042	no	5.98E-02	14.3	28.7	Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250		No	1.042	no	5.98E-02	14.3		Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	250		No	1.042	no	5.98E-02	14.3		Poupoulis and Jensen 1976
Copper sulfate	100	Duck (*Anas platyrhynchos*)	0/135	mg/kg diet	no	N	FD	16	day	2	days	JV	both	WO	135		No	0.092	no	1.23E-02	18.1		Wood and Worden, 1973
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/6.34	mg/org/d	no	N	FD	10	day	5	days	JV	male	WO	6.34		yes	0.3465	yes	3.51E-02	18.3		Ward et al, 1995
Copper	100	Chicken (*Gallus domesticus*)	0/50/150/250	mg/kg diet	no	N	FD	84	day	25	weeks	SM	female	WO	250		yes	1.5315	yes	1.22E-01	19.9		Ankari et al, 1998
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250	mg/kg diet	no	N	FD	24	day	1	days	JV	both	WO	250		yes	0.335	no	2.86E-02	21.3		Latymer and Coates, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/10.39/21.31/31.52/39.91	mg/org/d	no	N	FD	336	day	17	weeks	SM	female	WO	39.91		yes	1.85	yes	9.97E-02	21.6		Jackson, et. al., 1979
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/10.33	mg/org/d	no	N	DR	10	day	5	days	JV	male	WO	10.33		yes	0.389	yes	1.16E-01	26.6		Ward et al, 1995
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500/1000	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	500	1000	No	1.042	no	5.98E-02	28.7	57.4	Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/125/250/500/1000	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	500	1000	No	1.042	no	5.98E-02	28.7	57.4	Poupoulis and Jensen 1976

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	N	FD	5	weeks	1	days	JV	male	WO	500		No	1.042	no	5.98E-02	28.7		Hill, 1974
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	500		No	1.042	no	5.98E-02	28.7		Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	500		No	1.042	no	5.98E-02	28.7		Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	500		No	1.042	no	5.98E-02	28.7		Poupoulis and Jensen 1976
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/250/500	mg/kg diet	no	N	FD	4	weeks	1	days	JV	NR	WO	500		No	1.042	no	5.98E-02	28.7		Poupoulis and Jensen 1976
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	SM	female	WO	750		yes	1.82	yes	7.20E-02	29.7		Jackson and Stevenson, 1981
Tribasic copper chloride	100	Chicken (*Gallus domesticus*)	0/200/400/600	mg/kg diet	no	N	FD	42	day	1	days	JV	both	WO	600		yes	1.335	yes	6.62E-02	29.7		Miles et al 1998
Copper (II) sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/200/400/600	mg/kg diet	no	N	FD	42	day	1	days	JV	both	WO	600		yes	1.543	yes	7.92E-02	30.8		Miles et al 1998
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	280	day	18	weeks	SM	female	WO	750		yes	1.78	yes	7.51E-02	31.6		Jackson and Stevenson, 1981
Copper oxide	100	Chicken (*Gallus domesticus*)	0/403/570/749/1180	mg/kg diet	no	N	FD	10	weeks	1	days	JV	both	WO	570	749	yes	1.0166	no	5.88E-02	33	43.3	Mehring et al, 1960
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	SM	female	WO	750		yes	1.33	yes	6.24E-02	35.2		Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	280	day	18	weeks	SM	female	WO	750		yes	1.5	yes	7.08E-02	35.4		Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/23.5/43.84/56.47/60.43	mg/org/d	no	N	FD	232	day	17	weeks	SM	female	WO	60.43		yes	1.704	yes	7.56E-02	35.5		Jackson et al, 1979
Copper oxide	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	SM	female	WO	750		yes	2.13	yes	1.23E-01	43.3		Jackson and Stevenson, 1981
Cupric carbonate	100	Turkey (*Meleagris gallopavo*)	0/100/800	mg/kg diet	no	N	FD	3	weeks	7	days	JV	NR	WO	800		No	1	no	5.82E-02	46.6		Waibel et al, 1964
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/500/750	mg/kg diet	no	N	FD	21	day	1	days	JV	both	WO	750		yes	0.32	yes	2.06E-02	48.3		Christmas and Harms, 1979
Copper oxide	100	Chicken (*Gallus domesticus*)	0/150/300/450/600/750	mg/kg diet	no	N	FD	336	day	26	weeks	SM	female	WO	750		yes	1.77	yes	1.18E-01	50		Jackson and Stevenson, 1981
Copper sulfate pentahydrate	100	Turkey (*Meleagris gallopavo*)	0/810/1620/2430/3240	mg/kg diet	no	N	FD	21	day	NR	NR	JV	both	WO	810	1620	No	0.5	no	3.71E-02	60	120	Vohra and Kratzer, 1968
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/0.01486/0.02857/0.04828/0.0788 6/0.08657	g/org/d	no	N	FD	35	day	NR	NR	SM	female	WO	0.0866		No	1.38	yes	4.50E-02	62.7		Jackson, 1977
Copper sulfate pentahydrate	100	Chicken (*Gallus domesticus*)	0/500/1000/1500/2000/2500	mg/kg diet	no	N	FD	5	weeks	1	days	JV	female	WO	1000	1500	No	0.38	no	3.10E-02	81.6	122	Hill, 1974
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no	N	FD	2	weeks	1	days	JV	both	WO	1000		No	0.328	no	2.82E-02	85.9		Hill, 1979
Copper sulfate	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no	N	FD	14	day	1	days	JV	NR	WO	1000		yes	0.141	yes	1.31E-02	92.9		Jensen, 1975
Copper sulfate	100	Duck (*Anas platyrhynchos*)	0/1500	mg/kg diet	no	N	FD	15	day	1	days	JV	male	WO	1500		No	0.092	no	1.23E-02	201		Van Vleet et al, 1981
Copper carbonate	100	Chicken (*Gallus domesticus*)	0/42/76/98	mg/kg diet	no	N	FD	3	weeks	3	days	JV	male	WO		42	yes	0.2039	yes	1.30E-02		2.69	Ko et al, 1985
Copper sulfate pentahydrate	100	Duck (*Anas platyrhynchos*)	0/605.4	mg/L	no	N	DR	4	day	4	days	JV	NR	WO		605.4	No	0.092	no	1.19E-02		78.5	Foster, 1999
Copper (II) sulfate	39.81	Chicken (*Gallus domesticus*)	0/200/600/800/1200/1600	mg/kg bw	no	N	OR	3	weeks	25	weeks	JV	male	WO		200	yes	1.7	no	8.22E-02		79.6	Shivanandappa et al., 1983
Copper sulfate	100	Duck (*Anas platyrhynchos*)	0/1500	mg/kg diet	no	N	FD	15	day	1	days	JV	male	WO		1500	No	0.092	no	1.23E-02		201	Van Vleet et al, 1981
Copper oxychloride	59.51	Chicken (*Gallus domesticus*)	0/900/1200/1500/1800	mg/kg bw	no	N	OR	4	day	25	weeks	JV	male	WO		900	yes	1.7	no	8.22E-02		536	Shivanandappa et al., 1983
Lead																							
Reproduction																							
Lead acetate	100	Japanese quail (Coturnix japonica)	0/1/10/100	mg/kg diet	no		FD	5	weeks	6	weeks	LB	female	WO	1	10	No	0.2	yes	0.00E+00	0.2	1.9	Edens and Garlich, 1983
Lead acetate	100	Chicken (*Gallus domesticus*)	0/25/50	mg/kg diet	no		FD	4	weeks	NR	NR	LB	female	WO	25.0	50.0	No	1.81	yes	1.18E-01	1.63	3.26	Edens and Garlich, 1983
Lead oxide	100	Chicken (*Gallus domesticus*)	0/20/30/100	mg/kg diet	no		FD	30	day	22	weeks	LB	female	EGG	20.0	30.0	No	1.042	yes	1.40E-01	2.69	4.04	Meluzzi et al., 1996
Lead mixture	100	Mallard (*Anas platyrhynchos*)	0/100	mg/kg diet	no		FD	76	day	NR	NR	AD	female	EGG	100		No	1.1	no	6.19E-02	5.63		Haegele et al. 1974
Metallic lead	100	American kestrel (*Falco sparverius*)	0/19.80/104.40	mg/kg diet	no		FD	6	months	1-6	years	AD	female	WO	104		yes	0.1439	no	1.65E-02	12.0		Pattec 1984
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/1/10/100/1000	mg/kg diet	no		FD	5	weeks	6	days	JV	male	TE	100	1000	yes	0.11	no	1.38E-02	12.6	126	Morgan et al., 1975
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/10/100/500/1000	mg/kg diet	no		FD	5	weeks	1	days	JV	male	TE	500	1000	yes	0.09	no	1.21E-02	67.4	135	Morgan et al., 1975
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/500/1000	mg/kg diet	no		FD	32	day	NR	NR	AD	female	WO	1000		yes	0.113	no	1.41E-02	125		Stone and Soares, 1976
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/1/10/100/1000	ug/g diet	no		FD	12	weeks	0	days	LB	both	EGG		1.0	yes	0.159	no	1.75E-02		0.111	Edens et al., 1976
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/1/10/100	mg/kg diet	no		FD	12	weeks	NR	NR	LB	female	WO		1.0	yes	0.155	yes	3.00E-02		0.194	Edens and Garlich, 1983
Lead acetate	100	Chicken (*Gallus domesticus*)	0/50/100/200/400	mg/kg diet	no		FD	10	weeks	NR	NR	LB	female	WO		50.0	yes	1.81	yes	1.18E-01		3.26	Edens and Garlich, 1983
Lead acetate	100	Ringed Turtle Dove (*Streptopelia risoria*)	0/100	mg/L	no		DR	11	weeks	NR	NR	AD	male	TE		100	No	0.123	no	1.45E-02		11.8	Kendall and Scanlon, 1981
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/500	mg/kg diet	no		FD	1	weeks	14	weeks	JV	female	WO		500	yes	0.145	yes	2.70E-02		93.1	Edens and Melvin, 1989
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/3000	mg/kg diet	no		FD	27	day	NR	NR	AD	female	WO		3000	yes	0.11	no	1.38E-02		377	Stone and Soares, 1976
Growth																							
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/1/10/100	mg/kg diet	no		FD	5	weeks	1	days	JV	female	WO	10.0	100	yes	0.147	yes	2.30E-02	1.56	15.6	Edens and Garlich, 1983
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/5.4/16.2	mg/kg diet	no		FD	2	weeks	1	days	JV	both	WO	16.2		yes	0.0455	no	7.79E-03	2.77		Stone and Fox, 1984
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/25	mg/kg diet	no		FD	2	weeks	1	days	JV	NR	WO	25.0		yes	0.036	no	6.69E-03	4.64		Stone et al., 1977
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/50/500	mg/kg diet	no		FD	4	weeks	0	days	JV	female	WO	50.0	500	yes	0.13	no	1.54E-02	5.93	59.3	Edens and Melvin, 1989
Lead acetate	100	Chicken (*Gallus domesticus*)	0/100/1000/2000	mg/kg diet	no		FD	4	weeks	4	weeks	JV	NR	WO	100	1000	No	1.042	yes	6.40E-02	6.1	61.4	Damron et al, 1969
Lead acetate	100	Chicken (*Gallus domesticus*)	0/10/100/1000	mg/kg diet	no		FD	4	weeks	4	weeks	JV	NR	WO	100	1000	No	1.042	yes	7.40E-02	7.1	71.0	Damron et al, 1969
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/1/10/100/1000	ug/g diet	no		FD	12	weeks	0	days	JV	female	WO	100	1000	yes	0.157	no	1.74E-02	11.1	111	Edens et al., 1976
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/1/10/100/1000	mg/kg diet	no		FD	12	weeks	1	weeks	JV	female	WO	100	1000	yes	0.154	no	1.72E-02	11.2	112	Edens, 1985
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/1/10/100/1000	mg/kg diet	no		FD	2	weeks	6	days	JV	NR	WO	100	1000	yes	0.11	no	1.38E-02	12.6	126	Morgan et al., 1975
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/10/100/500/1000	mg/kg diet	no		FD	1	weeks	1	days	JV	NR	WO	100	500	yes	0.09	no	1.21E-02	13.5	67.4	Morgan et al., 1975
Lead dichloride	100	Chicken (*Gallus domesticus*)	0/200	mg/kg diet	no		FD	21	day	1	days	JV	both	WO	200		No	0.564	no	4.01E-02	14.2		Howell and Hill, 1978
Lead dichloride	100	Chicken (*Gallus domesticus*)	0/400	mg/kg diet	no		FD	20	day	1	days	JV	both	WO	400		No	0.564	no	4.01E-02	28.4		Howell and Hill, 1978
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/25/50/100/200	mg/kg diet	no		FD	14	day	1	days	JV	both	WO	200		yes	0.0444	no	7.66E-03	34.5		Stone et al., 1981
Lead acetate	100	American kestrel (*Falco sparverius*)	0/119.7/212.05/448.3	mg/kg diet	no	68.2	FD	60	day	1-2	years	AD	both	WO	448		yes	0.1224	no	1.48E-02	54.3		Custer et al., 1984
Lead carbonate	100	Chicken (*Gallus domesticus*)	0/500/1000/1500/2000	mg/kg diet	no		FD	2	weeks	1	days	JV	male	WO	500	1000	yes	0.118	no	1.45E-02	61.3	123	Berg et al., 1980
Lead nitrate	100	Mallard (*Anas platyrhynchos*)	0/5/50/500	mg/kg diet	no		FD	8	day	9	days	JV	NR	WO	500		No	0.092	no	1.23E-02	66.9		Frederick, 1976
Lead acetate	100	Chicken (*Gallus domesticus*)	0/500/1000/1500/2000	mg/kg diet	no		FD	20	day	1	days	JV	male	WO		500	yes	0.46	no	3.51E-02		38.2	Donaldson and McGowan, 1989
Lead acetate	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no		FD	3	weeks	1	days	JV	male	WO		1000	No	1.3	no	6.90E-02		53.1	Latta and Donaldson, 1986
Lead acetate	100	Japanese quail (*Coturnix japonica*)	0/500/1000	mg/kg diet	no		FD	32	day	NR	NR	AD	female	WO		500	yes	0.103	no	1.33E-02		64.3	Stone and Soares, 1976
Lead acetate	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no		FD	19	day	1	days	JV	male	WO		1000	No	0.46	no	3.51E-02		76.3	Leeming and Donaldson, 1984
Lead carbonate	100	Chicken (*Gallus domesticus*)	0/1000/2000	mg/kg diet	no		FD	2	weeks	1	days	JV	male	WO		1000	yes	0.114	no	1.42E-02		124	Berg et al., 1980
Lead acetate trihydrate	100	Chicken (*Gallus domesticus*)	0/1100/2200/3300	mg/kg diet	no		FD	14	day	8	days	JV	male	WO		1100	No	0.084	no	1.16E-02		152	Bafundo et al.
Lead acetate	100	Chicken (*Gallus domesticus*)	0/2000	mg/kg diet	no		FD	20	day	1	days	JV	male	WO		2000	yes	0.384	no	3.12E-02		163	Donaldson, 1986
Lead acetate	100	Chicken (*Gallus domesticus*)	0/200	mg/kg bw/d	no		OR	4	weeks	NR	NR	JV	both	WO		200	yes	1.865	no	8.73E-02		200	Khan, et al, 1993
Lead acetate	100	Chicken (*Gallus domesticus*)	0/2000	mg/kg diet	no		FD	7	day	1	days	JV	male	WO		2000	yes	0.098	no	1.28E-02		262	Cupo and Donaldson, 1987
Lead carbonate	100	Chicken (*Gallus domesticus*)	0/2000	mg/kg diet	no		FD	2	weeks	1	days	JV	male	WO		2000	yes	0.09	no	1.21E-02		270	Berg et al., 1980
Lead acetate	100	Chicken (*Gallus domesticus*)	0/1850	mg/kg diet	no		FD	7	day	1	days	IM	NR	WO		1850	yes	0.0692	no	1.02E-02		273	Franson and Custer, 1982
Lead acetate trihydrate	100	Chicken (*Gallus domesticus*)	0/3300	mg/kg diet	no		FD	14	day	8	days	JV	male	WO		3300	No	0.084	no	1.16E-02		282	Bafundo et al.
Survival																							

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Lead nitrate	100	Mallard (*Anas platyrhynchos*)	0/1.76/5.13/21.63	mg/kg diet	yes	10.4	FD	12	weeks	1	years	AD	male	WO	21.6		yes	1.162	yes	1.19E-01	2.47		Finley et al., 1976
Lead dichloride	100	Chicken (*Gallus domesticus*)	0/200	mg/kg diet	no		FD	21	day	1	days	JV	both	WO	200		No	0.564	no	4.01E-02	14.2		Howell and Hill, 1978
Lead dichloride	100	Chicken (*Gallus domesticus*)	0/400	mg/kg diet	no		FD	20	day	1	days	JV	both	WO	400		No	0.564	no	4.01E-02	28.4		Howell and Hill, 1978
Lead acetate	100	American kestrel (*Falco sparverius*)	0/119.7/212.05/448.3	mg/kg diet	no		FD	60	day	1-2	years	AD	both	WO	448		yes	0.1224	no	1.48E-02	54.3		Custer et al., 1984
Lead nitrate	100	Mallard (*Anas platyrhynchos*)	0/5/50/500	mg/kg diet	no		FD	8	day	9	days	JV	NR	WO	500		No	0.092	no	1.23E-02	66.9		Frederick, 1976
Lead acetate	100	Chicken (*Gallus domesticus*)	0/500/1000/1500/2000	mg/kg diet	no		FD	20	day	1	days	JV	male	WO	2000		yes	0.378	no	3.09E-02	163		Donaldson and McGowan, 1989
Lead acetate	100	Goose *(Anser cygnides)*	0/500/1000/1500/2000	mg/kg diet	no		FD	12	weeks	26	weeks	JV	NR	WO	2000		No	2.27	yes	2.22E-01	196		Johnsen and Damron 1982
Lead acetate	100	Chicken (*Gallus domesticus*)	0/2000	mg/kg diet	no		FD	21	day	1	days	JV	male	WO		2000	yes	0.233	no	2.25E-02		194	Cupo and Donaldson, 1987
Mercury																							
Reproduction																							
Mercuric chloride		Japanese quail (*Coturnix japonica*)	2/4/8/16/32	mg/kg diet	no		FD	1	year	NR		NR	NR	WO	4		yes	0.2	yes	0.0169	0.45	1	Hill and Schaffner, 1976
Methyl mercury		Mallard Duck *(Anas platyrhynchos)*	0.5	ppm	no		FD	3	generations	NR	NR	MU	both	WO		1	yes	1.0	yes	0.1280	0.0064	0	Heinz 1979

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Manganese																							
Reproduction																							
Manganese oxide	100	Chicken (*Gallus domesticus*)	0/306	mg/d	NR	na	FD	12	weeks	23	weeks	LB	female	WO	306		No	1.6	yes	9.90E-01	191		Sazzad et al, 1994
Manganese oxide	100	Chicken (*Gallus domesticus*)	0/323	mg/d	NR	na	FD	12	weeks	23	weeks	LB	female	WO	323		No	1.6	yes	9.80E-01	202		Sazzad et al, 1994
Manganese oxide	100	Japanese quail (*Coturnix japonica*)	0/575	mg/kg bw/d	NR	na	FD	75	day	1	days	JV	male	TE	575		yes	0.099	yes	1.97E+00	575		Laskey and Edens, 1985
Growth																							
Manganese Sulfate	100	Chicken (*Gallus domesticus*)	0/5.85/6.61/7.44/11.64	mg/org/d	NR	na	FD	7	weeks	1	weeks	JV	male	WO	11.64		yes	0.5033	yes	5.40E-02	23.1		Spulkamy et al, 1976
Manganese sulfate	100	Chicken (*Gallus domesticus*)	0/220/330	mg/kg diet	NR	na	FD	4	weeks	1	days	JV	both	WO	330		yes	0.509	no	3.75E-02	24.3		Settle et al, 1969
Manganese sulfate monohydrate	100	Chicken (*Gallus domesticus*)	0/13.6/28.29	mg/org	NR	na	FD	14	day	8	days	JV	male	WO	28.29		No	0.564	no	4.01E-02	50.2		Wedekind and Baker, 1990
Manganese sulfate hydrate	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	NR	na	FD	21	day	1	days	JV	male	WO	1000		No	0.564	yes	4.05E-02	71.8		Henry et al., 1986
Manganese sulfate monohydrate	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	NR	na	FD	14	day	8	days	JV	male	WO	1000		yes	0.309	no	2.71E-02	87.7		Baker and Halpin, 1991
Manganese	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	NR	na	FD	1	weeks	2	weeks	JV	both	WO	1000		yes	0.2276	no	2.22E-02	97.6		De Rosa et al, 1980
Manganese sulfate	100	Chicken (*Gallus domesticus*)	0/1500	mg/kg diet	no	na	FD	14	day	4	days	JV	male	WO	1500		yes	0.5139	no	3.77E-02	110		Brown and Southern, 1985
Manganese sulfate monohydrate	100	Chicken (*Gallus domesticus*)	0/1000/2000/3000	mg/kg diet	NR	na	FD	3	weeks	1	days	JV	male	WO	3000		yes	0.4668	yes	3.06E-02	197		Black et al., 1985
Manganese oxide	100	Chicken (*Gallus domesticus*)	0/1000/2000/3000	mg/kg diet	NR	na	FD	21	day	1	days	JV	male	WO	3000		yes	0.5376	yes	3.62E-02	202		Black et al, 1984
Manganese sulfate hydrate	100	Chicken (*Gallus domesticus*)	0/1000/2000/3000	mg/kg diet	NR	na	FD	21	day	1	days	JV	male	WO	3000		No	0.564	no	4.01E-02	213		Wong-Valle et al, 1989
Manganese oxide	100	Chicken (*Gallus domesticus*)	0/1000/2000/3000	mg/kg diet	NR	na	FD	21	day	1	days	JV	male	WO	3000		No	0.564	no	4.01E-02	213		Wong-Valle et al, 1989
Manganese oxide	100	Chicken (*Gallus domesticus*)	0/372/744/1488	mg/kg diet	no	na	FD	14	day	1	days	JV	male	WO	744	1488	yes	0.2723	yes	7.89E-02	215	431	Martinez and Diaz, 1996
Manganese sulfate hydroxide	100	Chicken (*Gallus domesticus*)	0/1500/3000	mg/kg diet	NR	na	FD	14	day	8	days	JV	male	WO	3000		yes	0.35	no	2.94E-02	252		Southern and Baker, 1983
Manganese chloride tetrahydrate	100	Chicken (*Gallus domesticus*)	0/3000/4000/5000	mg/kg diet	NR	na	FD	14	day	7	days	JV	male	WO	3000	4000	yes	0.316	no	2.75E-02	261	348	Southern and Baker, 1983
Manganese sulfate monohydrate	100	Turkey (*Meleagris gallopavo*)	0/510/1020/2040/3000/3060/3620/4080/4800	mg/kg diet	NR	na	FD	21	day	NR	NR	JV	both	WO	4080	4800	No	0.5	no	3.71E-02	302	356	Vohra and Kratzer, 1968
Manganese dioxide	100	Chicken (*Gallus domesticus*)	0/3000/4000/5000	mg/kg diet	NR	na	FD	14	day	7	days	JV	male	WO	5000		yes	0.316	no	2.75E-02	435		Southern and Baker, 1983
Manganese sulfate hydrate	100	Chicken (*Gallus domesticus*)	0/3000/4000/5000	mg/kg diet	NR	na	FD	14	day	7	days	JV	male	WO	5000		yes	0.311	no	2.72E-02	437		Southern and Baker, 1983
Manganese carbonate	100	Chicken (*Gallus domesticus*)	0/3000/4000/5000	mg/kg diet	NR	na	FD	14	day	7	days	JV	male	WO	5000		yes	0.308	no	2.70E-02	439		Southern and Baker, 1983
Manganese oxide	100	Japanese quail (*Coturnix japonica*)	0/575	mg/kg bw/d	NR	na	FD	75	day	1	days	JV	male	WO	575		yes	0.099	yes	1.97E+00	575		Laskey and Edens, 1985
Manganous oxide	100	Chicken (*Gallus domesticus*)	0/110/220/440/880	mg/kg diet	NR	na	FD	21	day	1	days	JV	male	WO	880		No	0.564	yes	7.18E-01	1120		Leeson and Summers, 1982
Survival																							
Manganese	100	Chicken (*Gallus domesticus*)	0/1000/2000/4000	mg/kg diet	NR	na	FD	26	day	4	days	JV	both	WO	4000		No	1.042	yes	5.63E-02	216		Black et al., 1984
Manganese sulfate monohydrate	100	Turkey (*Meleagris gallopavo*)	0/510/1020/2040/3000/3060/3620/4080/4800	mg/kg diet	NR	na	FD	21	day	NR	NR	JV	both	WO	4800		No	0.5	no	3.71E-02	356		Vohra and Kratzer, 1968
Molybdenum																							
Reproduction																							
Sodium molybdate		Chicken (*Gallus domesticus*)	500/1000/2000	ppm	no	NR	FD	21	day	NR	NR	AD	NR	WO		500	yes	1.5	yes	1.06E-01	4	35.3	Lepore and Miller, 1965
Nickel																							
Reproduction																							
Nickel sulfate	100	Duck (*Anas platyrhynchos*)	0/12.5/50/200/800	mg/kg diet	no	na	FD	90	day	20	months	LB	female	EGG	800		No	1.1	yes	2.05E-01	149		Eastin and O'Shea, 1981
Nickel sulfate	100	Chicken (*Gallus domesticus*)	0/100/300/500	mg/kg diet	no	na	FD	60	day	22	weeks	LB	female	EGG		100	No	1.6	yes	1.31E-01		8.16	Meluzzi et al, 1996
Growth																							
Nickel chloride hexahydrate	24.69	Chicken (*Gallus domesticus*)	0/6/12	mg/kg diet	no	na	FD	28	day	21	days	JV	female	WO	12.0		yes	1.98	no	9.08E-02	0.136		Oscar et al, 1995
Nickel chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/50/250/2500	ng/g diet	no	na	FD	3	weeks	1	days	JV	male	WO	2500		yes	0.433	no	3.38E-02	0.195		Nielsen et al, 1975
Nickel chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/123.5/247/494	mg/kg diet	no	na	FD	42	day	1	days	JV	male	WO	123.5	247	yes	1.8901	no	8.81E-02	5.76	11.5	Martinez and Diaz, 1996
Nickelous chloride	45.29	Chicken (*Gallus domesticus*)	0/400/800	mg/kg diet	no	na	FD	5	weeks	1	days	JV	female	WO	400	800	No	1.042	no	5.98E-02	8.95	17.9	Hill, 1979
Nickel chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/400	mg/kg diet	no	na	FD	25	day	1	days	JV	both	WO	400		No	1.042	no	5.98E-02	22.9		Blalock and Hill, 1985
Nickel acetate	100	Chicken (*Gallus domesticus*)	0/3.04/9.25/13.68/14.61/15.86/16.21/17.25	mg/org/d	no	na	FD	4	weeks	1	days	JV	both	WO	13.7	14.6	yes	0.484	yes	1.00E-03	28.3	30.2	Weber and Reid, 1968
Nickel sulfate	100	Chicken (*Gallus domesticus*)	0/3.11/9.61/13.32/14.14/14.50/14.71/17.07	mg/org/d	no	na	FD	4	weeks	1	days	JV	both	WO	14.5	14.71	yes	0.467	yes	1.00E-03	31.0	31.5	Weber and Reid, 1968
Nickelous chloride	45.29	Chicken (*Gallus domesticus*)	0/400/800	mg/kg diet	no	na	FD	5	weeks	1	days	JV	female	WO		400	No	1.042	no	5.98E-02		8.95	Hill, 1979
Nickel sulfate	100	Duck (*Anas platyrhynchos*)	0/176/774/1069	mg/kg diet	no	na	FD	60	day	1	days	JV	female	HM		176	yes	1.023	no	5.91E-02		10.7	Cain and Pafford, 1981
Nickel chloride	100	Chicken (*Gallus domesticus*)	0/300/500/700/900/1100	mg/kg diet	no	na	FD	3	weeks	1	days	JV	male	WO		300	yes	0.4046	no	3.23E-02		23.9	Ling and Leach, 1979
Nickel chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/400	mg/kg diet	no	na	FD	19	day	NR	NR	JV	both	WO		400	No	0.0397	no	7.12E-03		71.8	Hill, 1985
Survival																							
Nickel sulfate	100	Duck (*Anas platyrhynchos*)	0/176/774/1069	mg/kg diet	no	na	FD	30	day	1	days	JV	both	WO	176	774	yes	1.023	no	5.91E-02	10.7	47.0	Cain and Pafford, 1981
Nickel chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/400	mg/kg diet	no	na	FD	25	day	1	days	JV	both	WO	400		No	1.042	no	5.98E-02	22.9		Blalock and Hill, 1985
Nickel chloride hexahydrate	100	Chicken (*Gallus domesticus*)	0/123.5/247/494	mg/kg diet	no	na	FD	42	day	1	days	JV	male	WO	494		yes	1.8901	no	8.81E-02	23.0		Martinez and Diaz, 1996
Nickel chloride	100	Chicken (*Gallus domesticus*)	0/300/500/700/900/1100	mg/kg diet	no	na	FD	3	weeks	1	days	JV	male	WO	300	500	yes	0.4046	no	3.23E-02	23.9	39.9	Ling and Leach, 1979
PAHs																							
Growth																							
Naphthalene	100	Bobwhite *(Colinus virginianus)*	0/316/562/1000/1780/3160/5620	mg/kg diet	no	na	FD	5	day	13	days	JV	both	WO	5620		yes	0.034	yes	1.00E-02	1653		Landis Assoc. Inc., 1985
Survival																							
Naphthalene	100	Bobwhite *(Colinus virginianus)*	0/316/562/1000/1780/3160/5620	mg/kg diet	no	na	FD	5	day	13	days	JV	both	WO	5620		yes	0.034	yes	1.00E-02	1653		Landis Assoc. Inc., 1985
PCBs																							
Reproduction																							
Aroclor 1242		Screech Owl (*Megascops sp.*)	3	ppm	no	NR	FD	2	generations	NR	NR	AD	both	WO	3		yes	0.181	yes	2.50E-02	0.41		McLane and Hughes, 1980
Aroclor 1254		Ring-necked Pheasant (*Phasianus colchicus*)	1.8	mg/kd/day	no	NR	OR	17	weeks	NR	NR	AD	NR	WO		1.8	yes	1	NR	NR	0.18	1.8	Dahlgren et al. 1972
Selenium																							
Reproduction																							
Selenous acid	100	Chicken (*Gallus domesticus*)	0/2/8	mg/kg diet	no	na	FD	76	weeks	1	days	LB	female	EGG	2	8	yes	1.967	no	9.04E-02	0.092	0.368	Thapar et al 1969
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/3.5/7	mg/kg diet	yes	10	FD	122	day	1	years	AD	both	WO	3.5	7	No	1.2	no	6.55E-02	0.212	0.425	Stanley et al, 1996
Se in food (seleniferous grain)	100	Chicken (*Gallus domesticus*)	0/2.5/5/10	mg/kg diet	no	na	FD	1	weeks	NR	NR	LB	female	WO	5	10	yes	2.4	no	1.03E-01	0.214	0.429	Poley and Moxon, 1937
Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	0/1/2/4/8/16	mg/kg diet	yes	1	FD	46	day	NR	NR	LB	both	WO	4	8	yes	1.225	no	6.64E-02	0.219	0.438	Heinz et. al., 1989
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/1/3/5	mg/kg diet	no	na	FD	28	weeks	32	weeks	LB	female	WO	3	5	No	1.6	yes	1.32E-01	0.247	0.412	Ort and Latshaw, 1978
Sodium selenite	100	Mallard (*Anas platyrhynchos*)	0/1/5/10/25	mg/kg diet	yes	1	FD	6	weeks	NR	NR	LB	both	WO	5	10	No	1.2	no	6.55E-02	0.273	0.546	Hoffman and Heinz, 1988
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/1.0/3.0/6.0	ug/g diet	no	na	FD	31	weeks	20	weeks	LB	both	WO	6		yes	1.8	no	8.53E-02	0.284		Moksnes and Norheim, 1982

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Seleno-DL-methionine	100	Chicken (*Gallus domesticus*)	0/0.1/0.5/1.0/3.0/6.0	mg/kg diet	no	na	FD	18	weeks	20	weeks	LB	female	EGG	6		yes	1.671	no	8.13E-02	0.292		Moksnes, 1983
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/2/8	mg/kg diet	no	na	FD	105	weeks	1	days	LB	female	WO	8		yes	1.82	no	8.60E-02	0.378		Thapar et al 1969
Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	0/10/20/40/80	mg/kg diet	yes	12.5	FD	16	weeks	1	years	AD	male	TE	10	20	yes	1.096	no	6.18E-02	0.644	1.29	Albers et al 1996
Seleno-DL-cysteine	100	Duck (*Anas platyrhynchos*)	0/16	mg/kg diet	yes	1	FD	49	day	NR	NR	LB	both	WO	16		yes	1.172	no	6.45E-02	0.890		Heinz et. al., 1989
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/7	mg/kg diet	no	na	FD	10	weeks	2	weeks	LB	both	EGG-WO	7		yes	0.1044	no	1.34E-02	0.896		Stoewsand, etl al, 1977
Sodium selenite	100	Mallard (*Anas platyrhynchos*)	0/1/5/10/25/100	mg/kg diet	yes	11	FD	57	weeks	2	years	LB	female	WO	10	25	yes	1.088	yes	1.00E-01	1.03	2.58	Heinz and Hoffman, 1987
Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	0/6.0/11.6	mg/kg diet	no	na	FD	11	weeks	NR	months	LB	female	EGG-EM	11.6		No	0.132	no	1.56E-02	1.37		Santolo et al 1999
Se in food (natural selenized wheat)	100	Japanese Quail (*Coturnix japonica*)	0/28	mg/kg diet	no	na	FD	10	weeks	NR	NR	JV	both	EGG-WO	28		yes	0.1001	no	1.30E-02	3.64		Stoewsand, etl al, 1977
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/2/8	mg/kg diet	no	na	FD	24	weeks	1	days	LB	female	EGG		2	yes	2.02	no	9.20E-02		0.0911	Arnold et al, 1973
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/1.3/2.0	mg/kg diet	no	na	FD	2	weeks	18	months	LB	female	WO		2	No	1.6	no	7.90E-02		0.0988	Kaantee and Kurkela, 1980
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/1	mg/kg diet	no	na	FD	32	day	NR	NR	LB	female	WO		1	yes	0.127	no	1.52E-02		0.120	Stone and Soares, 1976
Selenium	100	Chicken (*Gallus domesticus*)	0/15.15	mg/kg diet	no	na	FD	1	weeks	NR	NR	LB	female	WO		15.15	yes	1.48	yes	1.24E-02		0.127	Poley et al., 1937
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/6.5	ug/g diet	no	na	FD	93	day	1	years	LB	both	EM		6.5	No	1.2	no	6.55E-02		0.355	Stanley et al., 1994
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/8.8	mg/kg diet	no	na	FD	75	day	18	months	LB	female	EM		8.8	yes	1.394	no	7.23E-02		0.456	Heinz and Hoffman 1998
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/9.3	mg/kg diet	no	na	FD	4	weeks	NR	months	LB	female	EM		9.3	No	1.1	no	6.19E-02		0.524	Heinz and Hoffman 1996
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/10	mg/kg diet	yes	1	FD	6	weeks	NR	NR	LB	both	WO		10	No	1.2	no	6.55E-02		0.546	Hoffman and Heinz, 1988
Seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	0/10.3	mg/kg diet	no	na	FD	4	weeks	NR	months	LB	female	EM		10.3	No	1.1	no	6.19E-02		0.580	Heinz and Hoffman 1996
Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	0/10.9	mg/kg diet	no	na	FD	4	weeks	NR	months	LB	female	EM		10.9	No	1.1	no	6.19E-02		0.614	Heinz and Hoffman 1996
Seleno-DL-methionine	100	Black-crowned night-heron (*Nycticora*	0/10	mg/kg diet	yes	10	FD	92	day	NR	NR	LB	both	WO		10	No	0.883	no	5.37E-02		0.675	Smith et al, 1988
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/6/12	mg/kg diet	no	na	FD	16	weeks	1	days	JV	both	WO		6	No	0.135	no	1.58E-02		0.702	El-Begearmi et al, 1977
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/6	mg/kg diet	no	na	FD	16	weeks	NR	NR	LB	female	WO		6	No	0.1	no	1.30E-02		0.780	El-Begearmi et al, 1982
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/7	mg/kg diet	no	na	FD	5	weeks	15	days	JV	female	WO		7	No	0.132	no	1.56E-02		0.826	Stoewsand et al., 1978
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/10	mg/kg diet	yes	10	FD	41	day	2	years	LB	female	WO		10	yes	1.114	yes	1.00E-01		0.898	Heinz and Hoffman, 1987
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/19.8	mg/kg diet	yes	10	FD	21	weeks	NR	NR	LB	female	WO		19.8	yes	0.912	no	5.48E-02		1.19	Heinz and Fitzgerald, 1993
Seleno-DL-methionine	100	Owl (*Otus asio*)	0/8.81/30	mg/kg diet	no	na	FD	3	months	3	years	LB	both	WO		8.81	yes	0.196	yes	1.00E-01		4.49	Wiemeyer and Hoffman, 1996
Growth																							
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/0.31/0.97	mg/kg diet	no	na	FD	24	day	1	days	JV	male	WO	0.97		yes	0.723	no	4.71E-02	0.06322		Colnago et al, 1984
Selenium	100	Chicken (*Gallus domesticus*)	0/0.25/1/5	mg/kg diet	no	na	FD	3	weeks	1	days	JV	male	WO	1	5	yes	0.503	no	3.72E-02	0.0740	0.370	Jensen, 1986
Selenium (unspecified)	100	Chicken (*Gallus domesticus*)	0/1	mg/kg diet	no	na	FD	15	day	1	days	JV	NR	WO	1		No	0.328	no	2.82E-02	0.0859		Hegazy and Adachi, 2000
Selenous acid	100	Chicken (*Gallus domesticus*)	0/2/8	mg/kg diet	no	na	FD	4	weeks	1	days	JV	both	WO	2	8	yes	0.286	no	2.58E-02	0.180	0.721	Thapar et al 1969
Selenium dioxide	71.16	Chicken (*Gallus domesticus*)	0/5/10/20	mg/kg diet	no	na	FD	5	weeks	1	days	JV	female	WO	5	10	No	1.042	no	5.98E-02	0.204	0.408	Hill 1979
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/3/6/9	mg/kg diet	no	na	FD	3	weeks	1	days	JV	male	WO	3	6	No	0.564	no	4.01E-02	0.213	0.426	Echevarria et al., 1988
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/1.0/3.0/6.0	ug/g diet	no	na	FD	31	weeks	20	weeks	JV	both	WO	6		yes	1.8	no	8.53E-02	0.284		Moksnes and Norheim, 1982
Seleno-DL-methionine	100	Chicken (*Gallus domesticus*)	0/0.1/0.5/1.0/3.0/6.0	mg/kg diet	no	na	FD	18	weeks	20	weeks	SM	female	WO	6		yes	1.671	no	8.13E-02	0.292		Moksnes, 1983
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/1.0/3.0/6.0	mg/kg diet	no	na	FD	6	weeks	1	days	JV	both	WO	6		yes	1.3	no	6.90E-02	0.319		Moksnes and Norheim, 1982
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/2/8	mg/kg diet	no	na	FD	104	weeks	1	days	JV	both	WO	8		yes	1.91	no	9.58E-02	0.371		Arnold et al, 1973
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/2/8	mg/kg diet	no	na	FD	105	weeks	1	days	JV	female	WO	8		yes	1.82	no	8.60E-02	0.379		Thapar et al 1969
Se in food (seleniferous grain)	100	Chicken (*Gallus domesticus*)	0/2.5/5/10	mg/kg diet	no	na	FD	6	weeks	NR	NR	SM	female	WO	10		yes	2.4	no	1.03E-01	0.429		Poley and Moxon, 1937
Selenium dioxide	100	Chicken (*Gallus domesticus*)	0/2.5/5/10/20/40	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO	5	10	No	0.328	no	2.82E-02	0.429	0.859	Hill, 1974
Selenium	100	Chicken (*Gallus domesticus*)	0/5/10/20/40	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO	5	10	yes	0.116	no	1.43E-02	0.617	1.23	Jensen et al., 1977
Seleno-L-methione	100	Mallard (*Anas platyrhynchos*)	0/10/25/60	ug/g diet	yes	25	FD	21	day	NR	NR	JV	male	WO	10	25	yes	1.4	no	7.25E-02	0.690	1.72506	O'Toole and Raisbeck 1997
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/1/2/4	mg/L	no	na	DR	7	day	6	days	JV	male	WO	2	4	No	0.084	yes	3.01E-02	0.718	1.44	Cantor et al., 1984
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/8	mg/kg diet	no	na	FD	23	day	8	days	JV	both	WO	8		yes	0.103	yes	1.17E-02	0.909		Sell and Horani, 1976
Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	0/5.1/9.0	mg/kg diet	no	na	FD	77	day	NR	NR	MA	male	WO	9		No	0.132	no	1.56E-02	1.06		Yamamoto et al, 1998
Seleno-DL-methionine	98	Mallard (*Anas platyrhynchos*)	0/15/60	mg/kg diet	yes	6	FD	4	weeks	1	days	JV	both	WO	15	60	yes	0.566	no	4.02E-02	1.13	4.53	Hoffman et al, 1991
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/15/060	mg/kg diet	yes	16	FD	4	weeks	1	days	JV	both	WO	15	60	yes	0.611	no	4.22E-02	1.23	4.94	Hoffman et al, 1992
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/10	mg/kg diet	no	na	FD	10	day	1	days	JV	male	WO	10		No	0.084	no	1.16E-02	1.38		Ansari and Britton, 1974
Selenous acid	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	no	na	FD	20	day	1	days	JV	both	WO	20		No	0.564	no	4.01E-02	1.42		Howell and Hill, 1978
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/2/4/8	mg/L	no	na	DR	7	day	9	days	JV	both	WO	2	4	No	0.084	yes	6.09E-02	1.45	2.90	Cantor et al., 1984
Sodium selenite	97	Mallard (*Anas platyrhynchos*)	0/10/20/40/80	mg/kg diet	yes	7	FD	3	weeks	1	days	JV	NR	WO	10	20	yes	0.45	yes	7.50E-02	1.74	3.48	Heinz et al 1988
Selenomethionine	99	Mallard (*Anas platyrhynchos*)	0/10/20/40/80	mg/kg diet	yes	7	FD	3	weeks	1	days	JV	NR	WO	10	20	yes	0.45	yes	9.00E-02	2.13	4.26	Heinz et al 1988
Se in food (High selenium wheat)	100	Mallard (*Anas platyrhynchos*)	0/15	ug/g diet	no	na	FD	2	weeks	1	days	JV	NR	WO	15		yes	0.163	yes	3.30E-02	3.04		Heinz et al 1996
seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/15/30	ug/g diet	no	na	FD	2	weeks	1	days	JV	NR	WO	15	30	yes	0.191	yes	5.30E-02	4.16	8.32	Heinz et al 1996
seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	0/15/30	ug/g diet	no	na	FD	1	weeks	1	days	JV	NR	WO	15	30	yes	0.073	yes	2.80E-02	5.75	11.5	Heinz et al 1996
Selenium	100	Chicken (*Gallus domesticus*)	0/0.78/1.46/1.89/1.94	mg/org/d	no	na	FD	2	weeks	1	days	JV	both	WO	0.78	1.46	yes	0.123	no	1.49E-02	6.34	11.9	Jensen et al., 1977
Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	0/15/30	ug/g diet	no	na	FD	2	weeks	1	days	JV	NR	WO	30		yes	0.16	yes	3.90E-02	7.31		Heinz et al 1996
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/25/50/75	mg/kg diet	no	na	FD	4	weeks	1	days	JV	both	WO		25	No	1.042	yes	3.80E-03		0.0912	El-Begearmi and Combs, 1982
Selenium	100	Chicken (*Gallus domesticus*)	0/15.15	mg/kg diet	no	na	FD	1	weeks	NR	NR	SM	female	WO		15.15	yes	1.48	yes	1.24E-02		0.127	Poley et al., 1937
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/25/50/75	mg/kg diet	no	na	FD	4	weeks	1	days	JV	both	WO		25	No	1.042	yes	5.40E-03		0.130	El-Begearmi and Combs, 1982
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/25/50/75	mg/kg diet	no	na	FD	4	weeks	1	days	JV	both	WO		25	No	1.042	yes	7.50E-03		0.180	El-Begearmi and Combs, 1982
Sodium selenite	100	Mallard (*Anas platyrhynchos*)	0/0.5/5.0	mg/L	no	na	DR	9	day	9	months	JV	male	WO	0.5	5	yes	1.24	no	6.82E-02		0.275	Fairbrother and Fowles, 1990
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/1/3	mg/kg diet	no	na	FD	2	weeks	7	days	JV	both	WO		3	yes	0.20	no	2.04E-02		0.306	Dafalla and Adam, 1986
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/0.5	mg/kg bw/d	no	na	OR	4	weeks	NR	NR	JV	both	WO		0.5	yes	1.368	no	7.14E-02		0.50	Khan et al, 1993
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/8	mg/kg diet	no	na	FD	28	day	1	days	JV	male	WO		8	yes	0.267	yes	2.10E-02		0.629	Sell and Horani, 1976
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/10.0	mg/kg diet	no	na	FD	24	day	14	days	JV	male	WO		10	yes	0.42	no	3.31E-02		0.788	Elzubeir and Davis, 1988
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/10	mg/kg diet	no	na	FD	21	day	14	days	JV	male	WO		10	yes	0.332	no	2.84E-02		0.855	Davis, el. al. 1996
Selenium dioxide	100	Chicken (*Gallus domesticus*)	0/10	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO		10	No	0.328	no	2.82E-02		0.859	Hill, 1979
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/7	mg/kg diet	no	na	FD	10	weeks	2	weeks	JV	both	WO		7	yes	0.1044	no	1.34E-02		0.896	Stoewsand, etl al, 1977
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/19.8	mg/kg diet	yes	10	FD	21	weeks	NR	NR	SM	both	WO		19.8	yes	1.198	no	5.48E-02		1.08	Heinz and Fitzgerald, 1993
Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	0/15/60	mg/kg diet	yes	6	FD	4	weeks	1	days	JV	both	WO		15	yes	0.479	no	3.60E-02		1.20	Hoffman et al, 1992
Sodium selenate	100	Chicken (*Gallus domesticus*)	0/10/20	mg/kg diet	no	na	FD	2	weeks	1	days	JV	NR	WO		10	yes	0.084	no	1.16E-02		1.38	Berg and Martinson, 1972
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/15	mg/kg diet	no	na	FD	14	day	8	days	JV	male	WO		15	yes	0.193	no	1.99E-02		1.55	Lowry and Baker, 1989
Selenium dioxide	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO		20	No	0.328	no	2.82E-02		1.72	Hill, 1979
Selenous acid	100	Chicken (*Gallus domesticus*)	0/25	mg/kg diet	no	na	FD	21	day	1	days	JV	both	WO		25	No	0.564	no	4.01E-02		1.78	Howell and Hill, 1978
Sodium selenate	100	Chicken (*Gallus domesticus*)	0/20/40	mg/kg diet	no	na	FD	20	day	1	days	JV	male	WO		20	yes	0.147	no	1.67E-02		2.27	Donaldson and McGowan, 1989

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Selenium oxide	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	no	na	FD	1	weeks	1	days	JV	female	WO		20	No	0.084	no	1.16E-02		2.76	Hill, 1980
Se in food (natural selenized wheat)	100	Japanese Quail (*Coturnix japonica*)	0/28	mg/kg diet	no	na	FD	10	weeks	NR	NR	JV	both	WO		28	yes	0.1001	no	1.30E-02		3.64	Stoewsand, etl al, 1977
Survival																							
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/2/8	mg/kg diet	no	na	FD	24	weeks	1	days	JV	female	WO	2	8	yes	1.91	no	9.20E-02	0.093	0.371	Arnold et al, 1973
Sodium selenite	100	Duck (*Anas platyrhynchos*)	0/2	mg/kg diet	no	na	FD	15	day	1	days	JV	male	WO	2		No	0.46	no	3.51E-02	0.153		Van Vleet et al, 1981
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/25/50/75	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO	25	50	No	0.328	yes	3.80E-03	0.290	0.579	El-Begearmi and Combs, 1982
Seleno-DL-methionine	100	Chicken (*Gallus domesticus*)	0/0.1/0.5/1.0/3.0/6.0	mg/kg diet	no	na	FD	18	weeks	20	weeks	SM	female	WO	6		yes	1.671	no	8.13E-02	0.292		Moksnes, 1983
Selenous acid	100	Chicken (*Gallus domesticus*)	0/2/8	mg/kg diet	no	na	FD	76	weeks	1	days	JV	female	WO	8		yes	1.967	no	9.04E-02	0.368		Thapar et al 1969
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/2/8	mg/kg diet	no	na	FD	105	weeks	1	days	JV	both	WO	8		No	1.82	no	8.60E-02	0.378		Thapar et al 1969
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/25/50/75	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO	25	50	No	0.328	yes	5.40E-03	0.412	0.823	El-Begearmi and Combs, 1982
seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/10/20/40/80	ug/g diet	no	na	FD	13	weeks	NR	months	AD	male	WO	10	20	yes	1.1	no	6.19E-02	0.563	1.13	Heinz and Fitzgerald 1993
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/25/50/75	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO	25	50	No	0.328	yes	7.50E-03	0.572	1.14	El-Begearmi and Combs, 1982
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/5	mg/kg diet	no	na	FD	4	weeks	1	days	JV	both	WO	5		No	0.12	no	1.46E-02	0.610		Stoewsand et al., 1974
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/8	mg/kg diet	no	na	FD	28	day	1	days	JV	male	WO	8		yes	0.267	yes	2.10E-02	0.629		Sell and Horani, 1976
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/3/6/9	mg/kg diet	no	na	FD	3	weeks	1	days	JV	male	WO	9		No	0.564	no	4.01E-02	0.64		Echevarria et al., 1988
Seleno-L-methione	100	Mallard (*Anas platyrhynchos*)	0/10/25/60	ug/g diet	yes	25	FD	50	day	NR	NR	AD	male	WO	10	60	yes	1.35	no	7.08E-02	0.699	4.19302	O'Toole and Raisbeck 1997
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/6/12	mg/kg diet	no	na	FD	12	weeks	1	days	JV	both	WO	6	12	No	0.135	no	1.58E-02	0.702	1.40	El-Begerami et al, 1977
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/6	mg/kg diet	no	na	FD	16	weeks	NR	NR	NR	both	WO	6		No	0.1	no	1.30E-02	0.780		El-Begearmi et al, 1982
Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	0/15	mg/kg diet	no	na	FD	21	weeks	NR	NR	AD	male	WO	15		No	1.1	no	6.19E-02	0.844		Heinz 1993
Selenium dioxide	100	Chicken (*Gallus domesticus*)	0/10	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO	10		No	0.328	no	2.82E-02	0.859		Hill, 1979
Seleno-DL-cysteine	100	Duck (*Anas platyrhynchos*)	0/16	mg/kg diet	yes	1	FD	49	day	NR	NR	SM	both	WO	16		yes	1.172	no	6.45E-02	0.890		Heinz et. al., 1989
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/7	mg/kg diet	no	na	FD	10	weeks	2	weeks	JV	both	WO	7		yes	0.1044	no	1.34E-02	0.896		Stoewsand, etl al, 1977
Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	0/8	mg/kg diet	no	na	FD	23	day	8	days	JV	both	WO	8		No	0.103	yes	1.17E-02	0.909		Sell and Horani, 1976
Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	0/1/2/4/8/16	mg/kg diet	yes	1	FD	46	weeks	NR	NR	SM	both	WO	16		yes	1.1	no	6.19E-02	0.910		Heinz et. al., 1989
Natural selenium	100	American Kestrel (*Falco sparverius*)	0/8.0	mg/kg diet	no	na	FD	77	day	NR	NR	MA	both	WO	8		No	0.132	no	1.56E-02	0.944		Yamamoto et al, 1998
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/10	mg/kg diet	yes	11	FD	41	day	2	years	SM	female	WO	10		yes	1.114	yes	1.00E-01	1.01		Heinz and Hoffman, 1987
Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	0/5.1/9.0	mg/kg diet	no	na	FD	77	day	NR	NR	MA	both	WO	9		No	0.132	no	1.56E-02	1.06		Yamamoto et al, 1998
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/19.8	mg/kg diet	yes	10	FD	21	weeks	NR	NR	SM	both	WO	19.8		yes	1.198	no	5.48E-02	1.08		Heinz and Fitzgerald, 1993
Seleno-DL-methionine	98	Mallard (*Anas platyrhynchos*)	0/15/60	mg/kg diet	yes	6	FD	4	weeks	1	days	JV	both	WO	15	60	yes	0.566	no	4.02E-02	1.13	4.53	Hoffman et al, 1991
Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	0/15/60	mg/kg diet	yes	6	FD	4	weeks	1	days	JV	both	WO	15	60	yes	0.479	no	3.60E-02	1.20	4.80	Hoffman et al, 1992
Seleno-DL-methinonine	100	Mallard (*Anas platyrhynchos*)	0/10/20/40/80	mg/kg diet	yes	10.5	FD	16	weeks	14	months	AD	male	WO	20	40	No	1.2	no	6.55E-02	1.22	2.44	Green and Albers, 1997
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/15/060	mg/kg diet	yes	16	FD	4	weeks	1	days	JV	both	WO	15	60	yes	0.611	no	4.22E-02	1.23	4.94	Hoffman et al, 1992
Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	0/6.0/11.6	mg/kg diet	no	na	FD	11	weeks	NR	months	AD	both	WO	11.6		No	0.132	no	1.56E-02	1.37		Santolo et al 1999
Sodium selenite	100	Chicken (*Gallus domesticus*)	0/10	mg/kg diet	no	na	FD	10	day	1	days	JV	male	WO	10		No	0.084	no	1.16E-02	1.38		Ansari and Britton, 1974
Selenous acid	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	no	na	FD	20	day	1	days	JV	both	WO	20		No	0.564	no	4.01E-02	1.42		Howell and Hill, 1978
Selenium dioxide	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO	20		No	0.328	no	2.82E-02	1.72		Hill, 1979
Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/1/2/4/8/16/32	mg/kg diet	yes	1	FD	14	weeks	2	years	AD	male	WO	32		yes	0.986	no	5.77E-02	1.87		Hoffman et al, 1991
Seleno-DL-methionine	100	Black-crowned night-heron (*Nycticora*	0/10/30	mg/kg diet	yes	10	FD	92	day	NR	NR	AD	both	WO	30		No	0.883	no	5.37E-02	2.03		Smith et al, 1988
Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	0/10/20/40/80	mg/kg diet	yes	12.5	FD	16	weeks	1	years	AD	male	WO	40	80	yes	0.944	no	5.61E-02	2.38	4.75	Albers et al 1996
Se in food (High selenium wheat)	100	Mallard (*Anas platyrhynchos*)	0/15	ug/g diet	no	na	FD	2	weeks	1	days	JV	NR	WO	15		yes	0.163	yes	3.30E-02	3.04		Heinz et al 1996
Sodium selenate	100	Chicken (*Gallus domesticus*)	0/20/40	mg/kg diet	no	na	FD	18	day	1	days	JV	male	WO	20	40	yes	0.064	no	9.72E-03	3.04	6.08	Donaldson and McGowan, 1989
Selenium	100	Chicken (*Gallus domesticus*)	0/5/10/20/40	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO	20	40	yes	0.062	no	9.52E-03	3.07	6.14	Jensen et al., 1977
Sodium selenite	100	Mallard (*Anas platyrhynchos*)	0/1/5/10/25/100	mg/kg diet	yes	11	FD	57	day	2	years	SM	both	WO	25	100	yes	0.913	yes	1.00E-01	3.08	12.3	Heinz and Hoffman, 1987
seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	0/15/30	ug/g diet	no	na	FD	1	weeks	1	days	JV	NR	WO	15	30	yes	0.073	yes	1.70E-02	3.49	6.99	Heinz et al 1996
Se in food (natural selenized wheat)	100	Japanese Quail (*Coturnix japonica*)	0/28	mg/kg diet	no	na	FD	10	weeks	2	weeks	JV	both	WO	28		yes	0.1001	no	1.30E-02	3.64		Stoewsand, etl al, 1977
seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	0/15/30	ug/g diet	no	na	FD	2	weeks	1	days	JV	NR	WO	30		yes	0.121	yes	1.50E-02	3.72		Heinz et al 1996
Selenomethionine	99	Mallard (*Anas platyrhynchos*)	0/10/20/40/80	mg/kg diet	yes	7	FD	3	weeks	1	days	JV	NR	WO	20	40	yes	0.40	yes	7.50E-02	3.99	7.98	Heinz et al 1988
Sodium selenite	97	Mallard (*Anas platyrhynchos*)	0/10/20/40/80	mg/kg diet	yes	7	FD	2	weeks	1	days	JV	NR	WO	20	40	yes	0.125	yes	3.50E-02	5.84	11.7	Heinz et al 1988
Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	0/15/30	ug/g diet	no	na	FD	2	weeks	1	days	JV	NR	WO	30		yes	0.16	yes	3.90E-02	7.31		Heinz et al 1996
Selenium	100	Chicken (*Gallus domesticus*)	0/0.78/1.46/1.89/1.94	mg/org/d	no	na	FD	2	weeks	1	days	JV	both	WO	1.89	1.94	yes	0.067	no	1.00E-02	28.2	29.0	Jensen et al., 1977
Selenous acid	100	Chicken (*Gallus domesticus*)	0/25	mg/kg diet	no	na	FD	21	day	1	days	JV	both	WO		25	No	0.564	no	4.01E-02		1.78	Howell and Hill, 1978
Selenium oxide	100	Chicken (*Gallus domesticus*)	0/40	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO		40	No	0.328	no	2.82E-02		3.44	Hill, 1974
Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	0/100	mg/kg diet	no	na	FD	5	weeks	NR	NR	AD	male	WO		100	yes	1.2	no	6.55E-02		5.75	Heinz 1993
Silver																							
Growth																							
Silver acetate	100	Turkey (*Meleagris gallopavo*)	0/300/900	mg/kg	no	na	FD	5	weeks	1	days	JV	both	WO		300	yes	0.662	no	4.45E-02		20.2	Jensen et al, 1974
Silver acetate	100	Turkey (*Meleagris gallopavo*)	0/900	mg/kg	no	na	FD	5	weeks	1	days	JV	both	WO		900	yes	0.528	no	3.84E-02		65.5	Jensen et al, 1974
Silver nitrate	100	Turkey (*Meleagris gallopavo*)	0/900	ppm in mg/kg	no	na	FD	4	weeks	1	days	JV	both	WO		900	yes	0.422	no	3.32E-02		70.8	Peterson et al, 1973
Silver nitrate	100	Chicken (*Gallus domesticus*)	0/900	ppm in mg/kg	no	na	FD	28	day	1	days	JV	NR	WO		900	yes	0.390	no	3.15E-02		72.8	Petersen and Jensen, 1975
Silver nitrate	100	Chicken (*Gallus domesticus*)	0/900	ppm in mg/kg	no	na	FD	28	day	1	days	JV	both	WO		900	yes	0.286	no	2.58E-02		81.1	Peterson and Jensen, 1975
Silver nitrate	100	Chicken (*Gallus domesticus*)	0/1000	ppm in mg/kg	no	na	FD	14	day	1	days	JV	NR	WO		1000	yes	0.173	yes	1.53E-02		88.4	Jensen , 1975
Survival																							
Silver nitrate	100	Chicken (*Gallus domesticus*)	0/1000	ppm in mg/kg	no	na	FD	14	day	1	days	JV	NR	WO		1000	yes	0.1890	yes	1.35E-02		71.4	Jensen , 1975
Silver nitrate	100	Chicken (*Gallus domesticus*)	0/900	ppm in mg/kg	no	na	FD	28	day	1	days	JV	NR	WO		900	yes	0.3900	no	3.15E-02		72.8	Petersen and Jensen, 1975
Silver nitrate	100	Chicken (*Gallus domesticus*)	0/900	ppm in mg/kg	no	na	FD	28	day	1	days	JV	both	WO		900	yes	0.2860	no	2.58E-02		81.1	Peterson and Jensen, 1975
Silver acetate	64.6	Duck (*Anas platyrhynchos*)	0/0.2	% in diet	no	na	FD	3	weeks	1	days	JV	female	WO		0.2	No	0.4600	no	3.51E-02		98.6	Van Vleet, 1977
Silver acetate	100	Duck (*Anas platyrhynchos*)	0/3000	mg/kg	no	na	FD	15	day	1	days	JV	male	WO		3000	No	0.0920	no	1.23E-02		401	Van Vleet et al, 1981
Vanadium																							
Reproduction																							
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/2/4/6/7.9	mg/kg diet	NR		FD	7	day	41	weeks	LB	female	EGG	4.0	6.0	No	1.6	yes	1.10E-01	0.275	0.413	Sell et al, 1982
Dicalcium phosphate	100	Chicken (*Gallus domesticus*)	0/4.6/7.4	mg/kg diet	no		FD	4	weeks	25	weeks	LB	female	EGG	4.60	7.40	No	1.6	yes	1.13E-01	0.325	0.524	Sell et al, 1986
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/5	mg/kg diet	no		FD	6	weeks	72	weeks	LB	female	EGG	5.0		No	1.6	yes	1.17E-01	0.366		Benabdeljelil and Jensen, 1989
Vanadate chloride	100	Chicken (*Gallus domesticus*)	0/20/40	mg/kg diet	no		FD	4	weeks	40	weeks	LB	female	EGG	20.0	40.0	No	1.6	no	7.90E-02	0.988	1.98	Ousterhout and Berg, 1981
Vanadyl sulfate	100	Chicken (*Gallus domesticus*)	0/20/40	mg/kg diet	no		FD	4	weeks	40	weeks	SM	female	EGG	20.0	40.0	No	1.6	no	7.90E-02	0.988	1.98	Ousterhout and Berg, 1981
Calcium orthovanadate	100	Chicken (*Gallus domesticus*)	0/12.5/25/50/100	mg/kg diet	no		FD	84	day	29	weeks	LB	female	WO	25.0	50.0	yes	1.554	no	7.76E-02	1.25	2.50	Kubena and Phillips 1982

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/20/40/80	mg/kg diet	no		FD	4	weeks	50	weeks	LB	female	EGG	80.0		No	1.6	no	7.90E-02	3.95		Ousterhout and Berg, 1981
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/100/300	mg/kg diet	no		FD	1	months	28	weeks	LB	female	WO	100	300	No	1.6	no	7.90E-02	4.94	14.8	Hafez and Kratzer 1976
Ammonium vanadate	100	Japanese Quail (*Coturnix japonica*)	0/50/100/200/300	mg/kg diet	no		FD	1	months	NR	NR	LB	female	WO	300		No	0.1	no	1.30E-02	39.0		Hafez and Kratzer 1976
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/5	mg/kg diet	no		FD	8	weeks	25	weeks	LB	female	EGG		5.0	No	1.6	yes	1.02E-01		0.319	Benabdeljelil and Jensen, 1989
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/10	mg/kg diet	no		FD	6	weeks	NR	NR	LB	female	EGG		10.0	yes	1.791	no	8.51E-02		0.475	Jensen and Maurice, 1980
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/10/20	mg/kg diet	no		FD	4	weeks	NR	NR	LB	female	EGG		10.0	No	1.6	no	7.90E-02		0.494	Jensen and Maurice, 1980
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/10/30/100	mg/kg diet	no		FD	2	weeks	43	weeks	LB	female	EGG		10.0	No	1.6	yes	1.07E-01		0.669	Benabdeljelil and Jensen, 1990
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/10.2/27.5/30.4	mg/kg diet	NR		FD	7	day	41	weeks	LB	female	EGG		10.2	No	1.6	yes	1.16E-01		0.740	Sell et al, 1982
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	no		FD	4	weeks	NR	NR	LB	female	EGG		20.0	No	1.6	no	7.90E-02		0.988	Jensen and Maurice, 1980
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/20/40	mg/kg diet	no		FD	4	weeks	35-40	weeks	LB	female	EGG		20.0	No	1.6	no	7.90E-02		0.988	Ousterhout and Berg, 1981
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/20/40/60	mg/kg diet	NR		FD	14	day	32	weeks	LB	female	EGG		20.0	No	1.6	yes	1.05E-01		1.31	Bressman, et al., 2002
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/18.6	mg/kg diet	NR		FD	9	day	25	weeks	LB	female	WO		18.6	No	1.6	yes	1.14E-01		1.33	Toussant and Latshaw, 1994
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/40/80	mg/kg diet	no		FD	4	weeks	48	weeks	LB	female	EGG		40.0	yes	1.6	no	7.90E-02		1.98	Ousterhout and Berg, 1981
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/40	mg/kg diet	no		FD	7	weeks	40-60	weeks	LB	female	WO		40.0	No	1.6	yes	1.10E-01		2.75	Ousterhout and Berg, 1981

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Growth																							
Calcium orthovanadate	17	Chicken (*Gallus domesticus*)	0/25/50/100	mg/kg diet	no		FD	25	weeks	1	days	JV	female	WO	25.0	50.0	No	1.042	no	5.98E-02	0.244	0.489	Phillips et al, 1982
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/5	mg/kg diet	no		FD	4	weeks	1	days	JV	male	WO	5.0		yes	0.687	yes	3.84E-02	0.279		Cervantes and Jensen, 1986
Ammonium metavandate	100	Chicken (*Gallus domesticus*)	0/5	ug/g diet	no		FD	4	weeks	1	days	JV	male	WO	5.0		yes	1.07	no	6.08E-02	0.284		Nielsen et al, 1980
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/5/10/20	mg/kg diet	no		FD	4	weeks	1	days	JV	male	WO	5.0	10.0	yes	0.65	yes	3.83E-02	0.295	0.589	Cervantes and Jensen, 1986
Sodium metavanadate	100	Chicken (*Gallus domesticus*)	0/3/6/12	mg/kg diet	no		FD	5	weeks	1	days	JV	female	WO	6.0	12.0	No	1.042	no	5.98E-02	0.344	0.688	Hill 1979
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/5	mg/kg diet	no		FD	8	weeks	25	weeks	SM	female	WO	5.0		No	1.6	yes	1.02E-01	0.366		Benabdeljelil and Jensen, 1989
NH4VO3	100	Chicken (*Gallus domesticus*)	0/10	mg/kg diet	no		FD	6	weeks	NR	NR	SM	female	WO	10.0		yes	1.791	no	8.51E-02	0.475		Jensen and Maurice, 1980
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/10/20/30	mg/kg diet	NR		FD	19	day	1	days	JV	female	WO	10.0	20.0	No	0.564	no	4.01E-02	0.711	1.42	Hill, 1990
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/10/20/40	mg/kg diet	NR		FD	19	day	1	days	JV	female	WO	10.0	20.0	No	0.564	no	4.01E-02	0.711	1.42	Hill, 1990
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/10/25	mg/kg diet	yes		FD	14	day	1	days	JV	NR	WO	10	25	No	0.328	no	2.82E-02	0.904	2.26	Hathcock et al., 1964
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/20/40	mg/kg diet	no		FD	4	weeks	35-40	weeks	SM	female	WO	20.0	40.0	No	1.6	no	7.90E-02	0.988	1.98	Ousterhout and Berg, 1981
Calcium vanadate	100	Chicken (*Gallus domesticus*)	0/10/15/20/30/40	mg/kg diet	NR		FD	21	day	7	days	JV	male	WO	20.0	30.0	No	1.3	no	6.90E-02	1.050	1.59	Romoser,et al, 1961
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/10/25/50	mg/kg diet	no		FD	14	day	1	days	JV	both	WO	10.0	25.0	yes	0.12	no	1.46E-02	1.22	3.05	Qureshi et al, 1999
Calcium orthovanadate	100	Chicken (*Gallus domesticus*)	0/12.5/25/50/100	mg/kg diet	no		FD	56	day	29	weeks	SM	female	WO	25.0	50.0	yes	1.526	no	7.66E-02	1.26	2.51	Kubena and Phillips 1982
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/10/30/100	mg/kg diet	no		FD	4	weeks	43	weeks	SM	female	WO	30.0	100	No	1.6	yes	9.80E-02	1.84	6.13	Benabdeljelil and Jensen, 1990
Vanadyl dichloride	100	Chicken (*Gallus domesticus*)	0/20/40	mg/kg diet	no		FD	4	weeks	40	weeks	SM	female	WO	40.0		No	1.6	no	7.90E-02	1.98		Ousterhout and Berg, 1981
Vanadyl sulfate	100	Chicken (*Gallus domesticus*)	0/20/40	mg/kg diet	no		FD	4	weeks	40	weeks	SM	female	WO	40.0		No	1.6	no	7.90E-02	1.98		Ousterhout and Berg, 1981
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/10.2/27.5/30.4	mg/kg diet	NR		FD	4	weeks	41	weeks	SM	female	WO	30.4		No	1.6	yes	1.16E-01	2.20		Sell et al, 1982
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/17/27/47/87	mg/kg diet	NR		FD	4	weeks	NR	NR	JV	male	WO	27	47	yes	0.319	no	2.77E-02	2.34	4.07	Nelson et al, 1962
Calcium orthovanadate	100	Chicken (*Gallus domesticus*)	0/12.5/25.0	mg/kg diet	no		FD	28	day	1	days	JV	male	WO	25.0		yes	0.25035	no	2.36E-02	2.36		Kubena et al, 1986
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/14.07/17/21.14/27/35.2	mg/kg diet	NR		FD	4	weeks	NR	NR	JV	male	WO	35.3	47.0	yes	0.464	no	3.53E-02	2.68	3.58	Nelson et al, 1962
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/50/100/200	mg/kg diet	no		FD	4	weeks	1	days	JV	male	WO	50.0	100	No	1.042	no	5.98E-02	2.87	5.74	Hafez and Kratzer 1976
Ammonium vanadate	100	Japanese Quail (*Coturnix japonica*)	0/50/100/200/300	mg/kg diet	no		FD	4	weeks	1	days	JV	male	WO	300		No	0.0618	no	9.50E-03	46.1		Hafez and Kratzer 1976
Vanadium	100	Chicken (*Gallus domesticus*)	0/10	mg/kg diet	NR		FD	3	weeks	NR	NR	JV	NR	WO		10.0	No	0.564	yes	1.91E-02		0.339	Summers and Moran, 1972
Sodium Vanadate	100	Chicken (*Gallus domesticus*)	0/5/10/15/20/25	mg/kg diet	no		FD	2	weeks	1	days	JV	both	WO		5.0	No	0.328	no	2.82E-02		0.429	Hill, 1974
Vanadyl Sulfate	100	Chicken (*Gallus domesticus*)	0/10/20	mg/kg diet	NR		FD	2	weeks	NR	NR	JV	male	WO		10.0	No	0.328	no	2.82E-02		0.859	Berg and Lawrence, 1971
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/10/20	mg/kg diet	NR		FD	2	weeks	NR	NR	JV	male	WO		10.0	No	0.328	no	2.82E-02		0.859	Berg and Lawrence, 1971
Vanadyl Dichloride	100	Chicken (*Gallus domesticus*)	0/10/20	mg/kg diet	NR		FD	2	weeks	NR	NR	JV	male	WO		10.0	No	0.328	no	2.82E-02		0.859	Berg and Lawrence, 1971
Vanadyl chloride	100	Chicken (*Gallus domesticus*)	0/10/20/40	mg/kg diet	no		FD	3	weeks	1	days	JV	female	WO		10.0	yes	0.233	no	2.26E-02		0.968	Blalock and Hill, 1987
Calcium vanadate	100	Chicken (*Gallus domesticus*)	0/23/48/55	mg/kg diet	NR		FD	21	day	9	days	JV	male	WO		23.0	No	1.042	no	5.98E-02		1.32	Romoser,et al, 1961
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/18.6	mg/kg diet	NR		FD	14	day	25	weeks	SM	female	WO		18.6	No	1.6	yes	1.14E-01		1.33	Toussant and Latshaw, 1994
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	no		FD	2	weeks	1	days	JV	both	WO		20	No	0.328	no	2.82E-02		1.72	Hill, 1979
Sodium metavanadate	100	Chicken (*Gallus domesticus*)	0/40	mg/kg diet	NR		FD	18	day	1	days	JV	female	WO		40.0	No	0.564	yes	2.50E-02		1.77	Hill, 1990
Sodium metavanadate	100	Chicken (*Gallus domesticus*)	0/25	mg/kg diet	NR		FD	19	day	1	days	JV	female	WO		25.0	No	0.564	no	4.01E-02		1.78	Hill, 1990
Sodium vanadate	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	NR		FD	21	day	1	days	JV	male	WO		20.0	yes	0.213	no	2.13E-02		2.00	Cupo and Donaldson, 1987
Calcium vanadate	100	Chicken (*Gallus domesticus*)	0/40/60/120/200/400/600	mg/kg diet	NR		FD	21	day	11	days	JV	male	WO		40.0	No	1.3	no	6.90E-02		2.12	Romoser,et al, 1961
Sodium metavanadate	100	Chicken (*Gallus domesticus*)	0/30	mg/kg diet	NR		FD	18	day	1	days	JV	female	WO		30.0	No	0.564	no	4.01E-02		2.13	Hill, 1990
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/25	mg/kg diet	no		FD	2	weeks	1	days	JV	both	WO		25	No	0.328	no	2.82E-02		2.15	Hill, 1979
Vanadyl Sulfate	100	Chicken (*Gallus domesticus*)	0/25	mg/kg diet	NR		FD	14	day	1	days	JV	NR	WO		25	No	0.328	no	2.82E-02		2.15	Hathcock et al., 1964
Sodium Vanadate	100	Chicken (*Gallus domesticus*)	0/25	mg/kg diet	NR		FD	1	weeks	1	days	JV	female	WO		25.0	No	0.328	no	2.82E-02		2.15	Hill, 1980
Sodium Vanadate	100	Chicken (*Gallus domesticus*)	0/25/50	mg/kg diet	no		FD	2	weeks	1	days	JV	female	WO		25.0	No	0.328	no	2.82E-02		2.15	Hill, 1974
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/40	mg/kg diet	no		FD	7	weeks	40-60	weeks	SM	female	WO		40.0	No	1.6	yes	1.10E-01		2.75	Ousterhout and Berg, 1981
Sodium vanadate	100	Chicken (*Gallus domesticus*)	0/40	mg/kg diet	NR		FD	19	day	1	days	JV	female	WO		40.0	No	0.564	no	4.01E-02		2.84	Hill, 1990
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/50/100/200	mg/kg diet	no		FD	4	weeks	1	days	JV	male	WO		50.0	No	1.042	no	5.98E-02		2.87	Hafez and Kratzer 1976
Ammonium metavanadate	100	Chicken (*Gallus domesticus*)	0/50/200	mg/kg diet	no		FD	4	weeks	1	days	JV	male	WO		50.0	No	1.041	no	5.97E-02		2.87	Hafez and Kratzer 1976
Ammoinium metavanadate	100	Chicken (*Gallus domesticus*)	0/50	mg/kg diet	NR		FD	21	day	1	days	JV	male	WO		50.0	No	0.564	no	4.01E-02		3.55	Hill, 1994
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/50	mg/kg diet	NR		FD	19	day	1	days	JV	NR	WO		50.0	No	0.564	no	4.01E-02		3.55	Hill, 1992
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/50	mg/kg diet	NR		FD	14	day	1	days	JV	NR	WO		50	No	0.328	no	2.82E-02		4.29	Hathcock et al., 1964
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/50	mg/kg diet	no		FD	14	day	1	days	JV	NR	WO		50	No	0.328	no	2.82E-02		4.29	Burt et al, 1991
Calcium orthovanadate	100	Chicken (*Gallus domesticus*)	0/50	mg/kg diet	no		FD	14	day	1	days	JV	male	WO		50	yes	0.24345	no	2.32E-02		4.76	Kubena et al, 1985
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/100/200	mg/kg diet	NR		FD	4	weeks	1	days	JV	male	WO		100	No	1.04E-06	no	5.98E-02		5.74	Hafez and Kratzer 1976
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/100	mg/kg diet	no		FD	8	weeks	1	days	JV	male	WO		100	yes	0.3543	no	2.96E-02		8.36	Hafez and Kratzer 1976
Survival																							
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/10/25	mg/kg diet	NR		FD	14	day	1	days	JV	NR	WO	10	25	No	0.328	no	2.82E-02	0.859	2.15	Hathcock et al., 1964
Vanadyl chloride	100	Chicken (*Gallus domesticus*)	0/10/20/40	mg/kg diet	no		FD	3	weeks	1	days	JV	female	WO	10	20	yes	0.237	no	2.28E-02	0.962	1.92	Blalock and Hill, 1987
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	no		FD	2	weeks	1	days	JV	both	WO	20		No	0.328	no	2.82E-02	1.72		Hill, 1979
Sodium Vanadate (NaVO3)	100	Chicken (*Gallus domesticus*)	0/25/50	mg/kg diet	no		FD	5	weeks	1	days	JV	both	WO	25	50	No	0.328	no	2.82E-02	2.15	4.294	Hill, 1974
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/25	mg/kg diet	no		FD	2	weeks	1	days	JV	both	WO	25		No	0.328	no	2.82E-02	2.15		Hill, 1979
Sodium Vanadate (NaVO3)	100	Chicken (*Gallus domesticus*)	0/5/10/15/20/25	mg/kg diet	no		FD	5	weeks	1	days	JV	female	WO	25		No	0.328	no	2.82E-02	2.15		Hill, 1974
Calcium orthovanadate	100	Chicken (*Gallus domesticus*)	0/12.5/25.0	mg/kg diet	NR		FD	28	day	1	days	JV	male	WO	25		yes	0.25035	no	2.36E-02	2.36		Kubena et al, 1986
Calcium orthovanadate	100	Chicken (*Gallus domesticus*)	0/12.5/25/50/100	mg/kg diet	no		FD	84	day	29	weeks	SM	female	WO	50	100	yes	1.554	no	7.76E-02	2.5	4.99	Kubena and Phillips 1982
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/50/200	mg/kg diet	no		FD	4	weeks	1	days	JV	male	WO	50	200	No	1.042	no	5.98E-02	2.87	11.5	Hafez and Kratzer 1976
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/50/100/200	mg/kg diet	no		FD	4	weeks	1	days	JV	male	WO	50	100	No	1.042	no	5.98E-02	2.87	5.74	Hafez and Kratzer 1976
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/50	mg/kg diet	NR		FD	21	day	1	days	JV	male	WO	50		No	0.564	no	4.01E-02	3.55		Hill, 1994
Calcium orthovanadate	100	Chicken (*Gallus domesticus*)	0/50	mg/kg diet	no		FD	28	day	1	days	JV	male	WO	50		yes	0.24345	no	2.32E-02	4.76		Kubena et al, 1985
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/50/100/200	mg/kg diet	no		FD	4	weeks	1	days	JV	male	WO	100	200	No	1.042	no	5.98E-02	5.74	11.5	Hafez and Kratzer 1976
Calcium vanadate	100	Chicken (*Gallus domesticus*)	0/40/60/120/200/400/600	mg/kg diet	NR		FD	21	day	11	days	JV	male	WO	120	200	No	1.3	no	6.90E-02	6.37	10.6	Romoser,et al, 1961
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/10/25/50	mg/kg diet	no		FD	14	day	1	days	JV	both	WO	50		yes	0.076	no	1.09E-02	7.15		Qureshi et al, 1999
Vanadyl sulfate	100	Duck (*Anas platyrhynchos)*	0/2.84/10.36/110	mg/kg diet	yes		FD	12	weeks	1	years	AD	both	WO	110		yes	1.17	yes	1.21E-01	12		White and Dieter, 1978
Vanadate	100	Duck (*Anas sp.)*	0/100	mg/kg diet	no		FD	15	day	1	days	JV	male	WO	100		No	0.092	no	1.23E-02	13.4		Van Vleet et al, 1981
Ammonium vanadate	100	Chicken (*Gallus domesticus*)	0/100/300	mg/kg diet	no		FD	1	months	28	weeks	JV	female	WO	300		No	1.6	no	7.90E-02	14.8		Hafez and Kratzer 1976
Ammonium vanadate	100	Japanese Quail (*Coturnix japonica*)	0/50/100/200/300	mg/kg diet	no		FD	4	weeks	1	days	JV	male	WO	300		No	0.0618	no	9.50E-03	98.7		Hafez and Kratzer 1976
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/20	mg/kg diet	NR		FD	2	weeks	NR	NR	JV	male	WO		20	No	0.328	no	2.82E-02		1.72	Berg and Lawrence, 1971
Vanadyl sulfate	100	Chicken (*Gallus domesticus*)	0/25	mg/kg diet	NR		FD	14	day	1	days	JV	NR	WO		25	No	0.328	no	2.82E-02		2.15	Hathcock et al., 1964

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/50	mg/kg diet	NR		FD	14	day	1	days	JV	NR	WO		50	No	0.328	no	2.82E-02		4.29	Hathcock et al., 1964
Ammonium Metavanadate	100	Chicken (*Gallus domesticus*)	0/100/200	mg/kg diet	NR		FD	4	weeks	1	days	JV	male	WO		100	No	1.042	no	5.98E-02		5.74	Hafez and Kratzer 1976

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Zinc																							
Reproduction																							
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/200	mg/kg diet	no	na	FD	12	weeks	NR	NR	LB	female	WO	200		yes	1.8	yes	1.24E-01	13.8		Kaya et al, 2001
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/330	mg/kg diet	no	na	FD	14	weeks	48	weeks	LB	female	WO	330		yes	2.262	no	9.90E-02	14.4		Schisler and Kienholz, 1967
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/500/2000	mg/kg diet	no	na	FD	6	weeks	NR	NR	LB	female	WO	500	2000	No	1.6	no	7.90E-02	24.7	98.8	Jensen and Maurice, 1980
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/55/105/125/159/148	mg/kg bw/d	no	na	FD	140	day	40	weeks	LB	female	WO	55	105	yes	1.86	yes	na	55	105	Jackson et al, 1986
Zinc acetate	100	Chicken (*Gallus domesticus*)	0/114.7/133/162.1/107.4/135.9	mg/d	no	na	FD	10	weeks	30	weeks	JV	female	WO	114.7	133	yes	2	yes	1.17E-01	57.3	66.5	Gibson et al, 1986
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/0.5/0.75/1.00/1.25/1.5/2.0/3.0/4.0	g/kg diet	no	na	FD	140	day	28	weeks	JV	female	WO	1.25	1.5	yes	1.955	yes	1.00E-01	63.9	76.7	Stevenson et al, 1987
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/113.4/218.3/202.3/196.3/216.3	mg/d	no	na	FD	10	weeks	30	weeks	LB	female	WO	113.4	218.3	yes	1.77	yes	1.26E-01	64.1	123	Gibson et al, 1986
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/0.5/0.75/1.00/1.25/1.50/2.0/3.0/4.0	g/kg diet	no	na	FD	140	day	28	weeks	LB	female	WO	1	1.25	yes	1.371	yes	9.30E-02	67.8	84.8	Stevenson et al, 1987
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/200/2000	mg/kg diet	no	na	FD	12	weeks	56	weeks	LB	female	WO	2000		yes	2.057	yes	1.09E-01	106		Stahl, et al, 1990
Zinc carbonate	100	Mallard duck (*Anas platyrhynchos*)	0/3000/6000/9000/12000	mg/kg diet	no	na	FD	60	day	7	weeks	JV	male	TE		3000	No	1.2	yes	1.25E-02		31.2	Gasaway and Buss, 1972
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/216/163/88/98	mg/kg bw/d	no	na	FD	1	weeks	40	weeks	SM	female	WO		88	yes	1.62	yes	na		88	Jackson et al, 1986
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/2000	mg/kg diet	no	na	FD	6	weeks	NR	NR	LB	female	WO		2000	yes	1.523	no	7.65E-02		101	Jensen and Maurice, 1980
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/20000	mg/kg diet	no	na	FD	5	day	71	weeks	LB	female	WO		20000	yes	1.889	yes	1.94E-02		205	Stepinska et al, 1987
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/367/480/505/325	mg/kg bw/d	no	na	FD	1	weeks	40	weeks	LB	female	WO		367	yes	1.34	yes	na		367	Jackson et al, 1986
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/20000	mg/kg diet	no	na	FD	4	day	60	weeks	LB	female	OD		20000	No	1.6	no	7.90E-02		988	Berry and Brake, 1985
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/2	% in diet	no	na	FD	49	day	66	weeks	LB	female	OD		2	No	1.6	no	7.90E-02		988	Berry and Brake, 1990
Growth																							
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/330	mg/kg diet	no	na	FD	14	weeks	48	weeks	JV	female	WO	330		yes	2.262	no	9.90E-02	14.4		Schisler and Kienholz, 1967
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/318	mg/kg diet	no	na	FD	14	day	8	days	JV	male	WO	318		No	0.564	yes	2.66E-02	15.0		Baker and Halpin, 1988
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/170	mg/kg diet	no	na	FD	16	day	5	days	JV	NR	WO	170		No	0.580	yes	5.48E-02	16.1		Mohanna and Nys, 1999
Zinc carbonate	100	Japanese quail (*Coturnix japonica*)	0/125	mg/kg diet	no	na	FD	14	day	0	days	JV	both	WO	125		yes	0.0448	no	7.71E-03	21.5		Hamilton et al, 1979
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	na	FD	3	weeks	1	days	JV	both	WO	500		No	1.042	no	5.98E-02	28.7		Hill, 1974
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/2171	mg/kg diet	no	na	FD	20	day	1	days	JV	both	WO	2171		No	0.564	yes	9.20E-03	35.4		Stahl et al, 1989
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/515	mg/kg diet	no	na	FD	19	day	1	days	JV	female	WO	515		No	0.564	no	4.01E-02	36.6		Hill, 1990
Zinc carbonate	100	Japanese quail (*Coturnix japonica*)	0/250/500	mg/kg diet	no	na	FD	14	day	1	days	JV	both	WO	250	500	yes	0.044	no	7.62E-03	43.3	86.6	Hamilton et al, 1981
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/55/105/125/159/148	mg/kg bw/d	no	na	FD	140	day	40	weeks	SM	female	WO	55	105	yes	2.18	yes	na	55	105	Jackson et al, 1986
Zinc carbonate	100	Japanese quail (*Coturnix japonica*)	0/250	mg/kg diet	no	na	FD	1	weeks	1	days	JV	both	WO	250		yes	0.02205	no	5.00E-03	55.1		Harland et al, 1975
Zinc Oxide	100	Chicken (*Gallus domesticus*)	0/200/400/800/1200/1600/2000	mg/kg diet	no	na	FD	2	weeks	1	days	JV	NR	WO	400	800	yes	0.084	no	1.16E-02	55.3	111	Berg and Martinson, 1972
Zinc chloride	100	Chicken (*Gallus domesticus*)	0/800	mg/kg diet	no	na	FD	5	weeks	1	days	JV	NR	WO	800		yes	0.253	yes	2.00E-02	63.2		Lefevre et al, 1982
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/500/1000/1500	mg/kg diet	no	na	FD	3	weeks	1	days	JV	male	WO	1000	1500	yes	0.521	yes	3.68E-02	70.6	106	Sandoval et al, 1998
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/1000/1500	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	1000	1500	yes	0.497	no	3.69E-02	74.3	111	Roberson and Schaible, 1960
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/1000/1500	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	1000	1500	yes	0.49	no	3.66E-02	74.7	112	Roberson and Schaible, 1960
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/1000/2000/3000	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	1000	2000	yes	0.483	no	3.62E-02	75.0	150	Roberson and Schaible, 1960
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/1000/1500	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	1000	1500	yes	0.47	no	3.56E-02	75.7	114	Roberson and Schaible, 1960
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/200/500/1000/2000	mg/kg diet	no	na	FD	2	weeks	1	days	JV	both	WO	1000	2000	No	0.328	no	2.82E-02	85.9	172	Hill, 1974
Zinc carbonate	100	Japanese quail (*Coturnix japonica*)	0/125/250/500/1000/2000	mg/kg diet	no	na	FD	14	day	8	days	JV	both	WO	500	1000	yes	0.0436	no	7.57E-03	86.8	174	Hamilton et al, 1979
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/500/1000/1500	mg/kg diet	no	na	FD	1	weeks	1	days	JV	male	WO	500	1000	No	0.084	yes	1.55E-02	92.3	185	Henry et al, 1987
Zinc	100	Chicken (*Gallus domesticus*)	0/1/2/3/4/5	g/kg diet	no	na	FD	10	weeks	30	weeks	JV	female	WO	2	3	yes	1.77	yes	8.58E-02	96.9	145	Gibson et al, 1986
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/0.5/0.75/1.00/1.25/1.5/2.0/3.0/4.0	g/kg diet	no	na	FD	140	day	28	weeks	JV	female	WO	2	3	yes	1.876	yes	9.30E-02	99.1	149	Stevenson et al, 1987
Zinc chloride	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no	na	FD	7	day	14	days	JV	male	WO	1000		No	0.564	yes	5.80E-02	103		Sandoval et al, 1999
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no	na	FD	7	day	14	days	JV	male	WO	1000		No	0.564	yes	5.80E-02	103		Sandoval et al, 1999
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/200/2000	mg/kg diet	no	na	FD	44	weeks	24	weeks	LB	female	WO	2000		yes	1.766	yes	1.14E-01	129		Stahl, et al, 1990
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/0.5/0.75/1.0/1/.25/1.50/2.0/3.0/4.0	g/kg diet	no	na	FD	140	day	28	weeks	LB	female	WO	2	3	yes	1.333	yes	8.60E-02	129	194	Stevenson et al, 1987
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/2000	mg/kg diet	no	na	FD	14	day	8	days	JV	female	WO	2000		No	0.564	no	4.01E-02	142		Bafundo et al, 1984
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/1000/2000/4000	mg/kg diet	no	na	FD	4	weeks	1	days	JV	both	WO	2000	4000	yes	0.615	yes	4.39E-02	143	286	Dewar et al, 1983
Zinc oxide	100	Turkey (*Meleagris gallopavo*)	0/1000/2000/4000/5950/8000/10000	mg/kg diet	no	na	FD	21	day	NR	NR	JV	both	WO	2000	4000	No	0.5	no	3.71E-02	148	297	Vohra and Kratzer, 1968
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/1000/2000/3000	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	2000	3000	yes	0.441	no	3.42E-02	155	232	Roberson and Schaible, 1960
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/1000/2000/3000	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	2000	3000	yes	0.419	no	3.30E-02	158	237	Roberson and Schaible, 1960
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/2000/4000	mg/kg diet	no	na	FD	14	day	8	days	JV	male	WO	2000	4000	yes	0.301	no	2.66E-02	177	354	Southern and Baker, 1983
Zinc acetate	100	Chicken (*Gallus domesticus*)	0/1000/2000/4000/8000/16000	mg/kg diet	no	na	FD	4	weeks	1	days	JV	NR	WO	4000	8000	yes	0.714	yes	4.49E-02	252	503	Oh et al, 1979
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/367/480/505/325	mg/kg bw/d	no	na	FD	1	weeks	40	weeks	SM	female	WO	367	480	yes	1.34	yes	na	367	480	Jackson et al, 1986
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no	na	FD	15	day	1	days	JV	NR	WO		1000	No	0.328	yes	7.10E-03		21.6	Lu and Combs, 1988
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/2183	mg/kg diet	no	na	FD	20	day	1	days	JV	both	WO		2183	No	0.564	yes	8.00E-03		31.0	Stahl et al, 1989
zinc oxide	100	Chicken (*Gallus domesticus*)	0/1000	mg/kg diet	no	na	FD	6	day	20	days	JV	NR	WO		1000	yes	0.000564	yes	2.20E-02		39.0	Lu and Combs, 1988
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	na	FD	7	day	14	days	JV	both	WO		500	No	1.042	yes	1.37E-01		65.7	Lu et al, 1990
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/216/163/88/98	mg/kg bw/d	no	na	FD	21	day	40	weeks	SM	female	WO		88	yes	1.62	yes	na		88	Jackson et al, 1986
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/2000	mg/kg diet	no	na	FD	6	weeks	NR	NR	SM	female	WO		2000	yes	1.523	no	7.65E-02		101	Jensen and Maurice, 1980
Zinc carbonate	100	Mallard duck (*Anas platyrhynchos*)	0/3000/6000/9000/12000	mg/kg diet	no	na	FD	10	day	7	weeks	JV	both	WO		3000	No	1.2	yes	5.04E-02		126	Gasaway and Buss, 1972
Zinc	100	Chicken (*Gallus domesticus*)	0/1549.3	mg/kg diet	no	na	FD	3	weeks	1	days	JV	both	WO		1549.3	yes	0.1217	yes	1.04E-02		132	Pimentel et al, 1992
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/2000/4000/6000	mg/kg diet	no	na	FD	4	weeks	2	weeks	JV	both	WO		2000	yes	0.551	no	3.95E-02		143	Dewar et al, 1983
Zinc Oxide	100	Chicken (*Gallus domesticus*)	0/2000	mg/kg diet	no	na	FD	2	weeks	1	days	JV	NR	WO		2000	yes	0.109	no	1.38E-02		252	Berg and Martinson, 1972
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/2000	mg/kg diet	no	na	FD	14	day	8	days	JV	male	WO		2000	No	0.244	no	1.16E-02		190	Bafundo et al, 1984
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/4000	mg/kg diet	no	na	FD	14	day	8	days	JV	male	WO		4000	No	0.564	no	4.01E-02		284	Bafundo et al, 1984
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/0.25/0.50/1.0	% in diet	no	na	FD	2	weeks	1	weeks	JV	female	WO		0.25	yes	0.406	yes	5.11E-02		315	Bartov, 1996
Zinc	100	Chicken (*Gallus domesticus*)	0/5000	mg/kg diet	no	na	FD	9	weeks	1	days	JV	NR	WO		5000	No	0.32	no	2.77E-02		433	Rama and Planas, 1981
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/5280	mg/kg diet	no	na	FD	1	weeks	1	days	JV	male	WO		5280	yes	0.09	yes	1.29E-02		757	Dean et al, 1991
Zinc Oxide	100	Chicken (*Gallus domesticus*)	0/0.7/0.8	% in diet	no	na	FD	2	weeks	1	weeks	JV	female	WO		0.7	yes	0.245	yes	3.20E-02		914	Bartov et al, 1994
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/20	mg/g diet	no	na	FD	5	day	38	weeks	JV	female	WO		20	No	1.6	no	7.90E-02		988	Palafox and Ho-A, 1980
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/0.65/0.75/0.85	% in diet	no	na	FD	2	weeks	1	weeks	JV	female	WO		0.65	yes	0.139	yes	2.93E-02		1370	Bartov, 1996

Table E-1. Avian Toxicity Data

Chemical Form	MW%	Test Species	Conc./ Doses	Conc/ Dose Units	Wet Weight Reported?	Percent Moisture	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Response Site[c]	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Survival																							
Zinc carbonate	100	Japanese quail (*Coturnix japonica*)	0/125	mg/kg diet	no	na	FD	14	day	0	days	JV	both	WO	125		yes	0.0448	no	7.71E-03	21.5		Hamilton et al, 1979
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/2183	mg/kg diet	no	na	FD	20	day	1	days	JV	both	WO	2183		No	0.564	yes	8.00E-03	31.0		Stahl et al, 1989
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/2171	mg/kg diet	no	na	FD	20	day	1	days	JV	both	WO	2171		No	0.564	yes	9.20E-03	35.4		Stahl et al, 1989
Zinc carbonate	100	Japanese quail (*Coturnix japonica*)	0/250	mg/kg diet	no	na	FD	1	weeks	1	days	JV	both	WO	250		yes	0.02205	no	5.00E-03	55.1		Harland et al, 1975
Zinc chloride	100	Chicken (*Gallus domesticus*)	0/800	mg/kg diet	no	na	FD	5	weeks	1	days	JV	NR	WO	800		yes	0.253	yes	2.00E-02	63.2		Lefevre et al, 1982
Zinc acetate	100	Chicken (*Gallus domesticus*)	0/114.7/133/162.1/107.4/135.9	mg/d	no	na	FD	10	weeks	30	weeks	JV	female	WO	107.4	135.9	yes	1.56	yes	3.81E-02	68.8	87.1	Gibson et al, 1986
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/200/300/400/500/600/700/800/900/1000	mg/kg diet	no	na	FD	4	weeks	1	weeks	JV	male	WO	1000		yes	0.473	no	3.58E-02	75.6		Roberson and Schaible, 1960
Zinc carbonate	100	Japanese quail (*Coturnix japonica*)	0/250/500	mg/kg diet	no	na	FD	14	day	1	days	JV	both	WO	500		yes	0.04	no	7.16E-03	89.5		Hamilton et al, 1981
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/1000/2000	mg/kg diet	no	na	FD	12	day	1	days	JV	female	WO	1000	2000	yes	0.164	no	1.79E-02	109	219	Blalock and Hill, 1988
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/1000/1500	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	1500		yes	0.455	no	3.49E-02	115		Roberson and Schaible, 1960
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/1000/1500	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	1500		No	0.402	no	3.22E-02	120		Roberson and Schaible, 1960
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/1000/1500	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	1500		yes	0.39	no	3.15E-02	121		Roberson and Schaible, 1960
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/1000/2000/4000	mg/kg diet	no	na	FD	4	weeks	1	days	JV	both	WO	2000	4000	yes	0.615	yes	4.39E-02	143	286	Dewar et al, 1983
Zinc carbonate	100	Chicken (*Gallus domesticus*)	0/1000/2000/3000	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	2000	3000	yes	0.407	no	3.24E-02	159	239	Roberson and Schaible, 1960
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/200/500/1000/2000	mg/kg diet	no	na	FD	5	weeks	1	days	JV	both	WO	2000		No	0.328	no	2.82E-02	172		Hill, 1974
Zinc carbonate	100	Japanese quail (*Coturnix japonica*)	0/125/250/500/1000/2000	mg/kg diet	no	na	FD	14	day	0	days	JV	both	WO	1000	2000	yes	0.0374	no	6.85E-03	183	366	Hamilton et al, 1979
Zinc acetate	100	Chicken (*Gallus domesticus*)	0/1000/2000/4000/8000/16000	mg/kg diet	no	na	FD	4	weeks	1	days	JV	NR	WO	4000	8000	yes	0.714	yes	4.49E-02	252	503	Oh et al, 1979
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/1000/2000/3000	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	3000		yes	0.337	no	2.87E-02	255		Roberson and Schaible, 1960
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/1000/2000/3000	mg/kg diet	no	na	FD	4	weeks	1	days	JV	male	WO	3000		yes	0.282	no	2.55E-02	272		Roberson and Schaible, 1960
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/10000/20000	mg/kg diet	no	na	FD	4	day	18	months	AD	female	WO	20000		No	1.6	yes	2.55E-02	319		Dewar et al, 1983
Zinc sulfate	100	Chicken (*Gallus domesticus*)	0/500	mg/kg diet	no	na	FD	3	weeks	1	days	JV	both	WO	500		No	0.001042	no	6.70E-04	320		Hill, 1974
Zinc oxide	100	Chicken (*Gallus domesticus*)	0/2000/4000/6000	mg/kg diet	no	na	FD	4	weeks	2	weeks	JV	both	WO	4000	6000	yes	0.377	no	3.08E-02	327	491	Dewar et al, 1983
Zinc oxide	100	Turkey (*Meleagris gallopavo*)	0/1000/2000/4000/5950/8000/10000	mg/kg diet	no	na	FD	21	day	NR	NR	JV	both	WO	10000		No	0.5	no	3.71E-02	741		Vohra and Kratzer, 1968
Zinc carbonate	100	Mallard duck (*Anas platyrhynchos*)	0/3000/6000/9000/12000	mg/kg diet	no	na	FD	30	day	7	weeks	JV	both	WO		3000	No	1.2	yes	5.04E-02		126	Gasaway and Buss, 1972
Zinc sulfate	100	Duck (*Anas platyrhynchos*)	0/3000	mg/kg diet	no	na	FD	15	day	1	days	JV	male	WO		3000	No	0.092	no	1.23E-02		401	Van Vleet et al, 1981
Zinc sulfate	100	Duck (*Anas platyrhynchos*)	0/6000	mg/kg diet	no	na	FD	15	day	1	days	JV	male	WO		6000	No	0.092	no	1.23E-02		803	Van Vleet et al, 1981

NA = Not applicable
NR = Not Reported
MW = Molecular weight
a. FD = food; OR = other oral; DR = drinking water
b. AD-adult; IM=immature; JV=juvenile; LB=egg laying bird; MA=mature; SM= sexually mature
c. EGG=egg; EM=embryo; SL=shell; WO=whole organism; GO=gonads; HM=humerus; OD=oviduct; OV=ovary; TE=testes; WI=wings

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Table E-2. Effects Based Tissue Concentrations for Birds - Cadmium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
American black duck	Bird		Adult	Growth	75	NOED	Ingestion	Kidney	1995. Silver TM; TD Nudds. Environ Pollut 090:153-161
American black duck	Bird		Adult	Growth	11	NOED	Ingestion	Liver	1995. Silver TM; TD Nudds. Environ Pollut 090:153-161
American black duck	Bird		Adult	Growth	3.5	NOED	Ingestion	Kidney	1995. Silver TM; TD Nudds. Environ Pollut 090:153-161
American black duck	Bird		Adult	Growth	45	NOED	Ingestion	Liver	1995. Silver TM; TD Nudds. Environ Pollut 090:153-161
Spotted Babylon	Bird		Juvenile	Mortality	5	NOED	Water	Probiscis	2005. Tanhen P, P Sretarugsa, P pokethitiyook, M Kruatrachue, ES Upatham. Environ Toxicol 20:142-149
Spotted Babylon	Bird		Juvenile	Mortality	15	NOED	Water	Esophagus	2005. Tanhen P, P Sretarugsa, P pokethitiyook, M Kruatrachue, ES Upatham. Environ Toxicol 20:142-149
Spotted Babylon	Bird		Juvenile	Mortality	100	NOED	Water	Stomach	2005. Tanhen P, P Sretarugsa, P pokethitiyook, M Kruatrachue, ES Upatham. Environ Toxicol 20:142-149
Spotted Babylon	Bird		Juvenile	Mortality	22	NOED	Water	Rectum	2005. Tanhen P, P Sretarugsa, P pokethitiyook, M Kruatrachue, ES Upatham. Environ Toxicol 20:142-149
Spotted Babylon	Bird		Juvenile	Mortality	2	NOED	Water	Foot	2005. Tanhen P, P Sretarugsa, P pokethitiyook, M Kruatrachue, ES Upatham. Environ Toxicol 20:142-149
Spotted Babylon	Bird		Juvenile	Mortality	45	NOED	Water	Digestive Gland	2005. Tanhen P, P Sretarugsa, P pokethitiyook, M Kruatrachue, ES Upatham. Environ Toxicol 20:142-149
Spotted Babylon	Bird		Juvenile	Mortality	50	NOED	Water	Gill	2005. Tanhen P, P Sretarugsa, P pokethitiyook, M Kruatrachue, ES Upatham. Environ Toxicol 20:142-149

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Table E-3. Effects Based Tissue Concentrations for Birds - Lead

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Mute swan	Bird	Fresh	Juvenile	Growth	3.2	ED24	Ingestion	Blood	2003. Day DD, WN Beyer, DJ Hoffman, A Morton, L Sileo, DJ Audet, MA Ottinger. Arch Environ Contam Toxicol 44:510-522
Mute swan	Bird	Fresh	Juvenile	Growth	2.2	ED24	Ingestion	Brain	2003. Day DD, WN Beyer, DJ Hoffman, A Morton, L Sileo, DJ Audet, MA Ottinger. Arch Environ Contam Toxicol 44:510-522
Mute swan	Bird	Fresh	Juvenile	Growth	8.5	ED24	Ingestion	Liver	2003. Day DD, WN Beyer, DJ Hoffman, A Morton, L Sileo, DJ Audet, MA Ottinger. Arch Environ Contam Toxicol 44:510-522

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Table E-4. Effects Based Tissue Concentrations for Birds - Mercury

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Bald eagle	Bird		Adult	Growth	6.7	NOED	Combined	Blood	2006. Weech SA, AM Scheuhammer, JE Elliott. Environ Tox & Chem 25:1433-1440
Bald eagle	Bird		Adult	Growth	40	NOED	Combined	Other	2006. Weech SA, AM Scheuhammer, JE Elliott. Environ Tox & Chem 25:1433-1440
Bald eagle	Bird		Adult	Reproduction	6.7	NOED	Combined	Blood	2006. Weech SA, AM Scheuhammer, JE Elliott. Environ Tox & Chem 25:1433-1440
Bald eagle	Bird		Adult	Reproduction	40	NOED	Combined	Other	2006. Weech SA, AM Scheuhammer, JE Elliott. Environ Tox & Chem 25:1433-1440
Bald eagle	Bird		Juvenile	Reproduction	0.57	NOED	Combined	Blood	2006. Weech SA, AM Scheuhammer, JE Elliott. Environ Tox & Chem 25:1433-1440
Bald eagle	Bird		Juvenile	Reproduction	18	NOED	Combined	Other	2006. Weech SA, AM Scheuhammer, JE Elliott. Environ Tox & Chem 25:1433-1440
Bald eagle	Bird		Adult	Reproduction	6.7	NOED	Combined	Blood	2006. Weech SA, AM Scheuhammer, JE Elliott. Environ Tox & Chem 25:1433-1440
Bald eagle	Bird		Adult	Reproduction	40	NOED	Combined	Other	2006. Weech SA, AM Scheuhammer, JE Elliott. Environ Tox & Chem 25:1433-1440
Bald eagle	Bird		Juvenile	Reproduction	0.57	NOED	Combined	Blood	2006. Weech SA, AM Scheuhammer, JE Elliott. Environ Tox & Chem 25:1433-1440
Bald eagle	Bird		Juvenile	Reproduction	18	NOED	Combined	Other	2006. Weech SA, AM Scheuhammer, JE Elliott. Environ Tox & Chem 25:1433-1440
Brandts cormorant	Bird		Adult	Mortality	0.649	NA	Ingestion	Brain	1977. Young, D.R., and T.C. Heeson. Coastal Water Research Program Annual Report. Southern California Coastal
Brandts cormorant	Bird		Adult	Mortality	0.986	NA	Ingestion	Breast	1977. Young, D.R., and T.C. Heeson. Coastal Water Research Program Annual Report. Southern California Coastal
Brandts cormorant	Bird		Adult	Mortality	2.94	NA	Ingestion	Liver	1977. Young, D.R., and T.C. Heeson. Coastal Water Research Program Annual Report. Southern California Coastal
Brandts cormorant	Bird		Adult	Mortality	3.07	NA	Ingestion	Liver	1977. Young, D.R., and T.C. Heeson. Coastal Water Research Program Annual Report. Southern California Coastal
Brown pelican	Bird		Adult	Mortality	0.203	NA	Ingestion	Brain	1977. Young, D.R., and T.C. Heeson. Coastal Water Research Program Annual Report. Southern California Coastal
Brown pelican	Bird		Adult	Mortality	0.347	NA	Ingestion	Breast	1977. Young, D.R., and T.C. Heeson. Coastal Water Research Program Annual Report. Southern California Coastal
Brown pelican	Bird		Adult	Mortality	0.807	NA	Ingestion	Liver	1977. Young, D.R., and T.C. Heeson. Coastal Water Research Program Annual Report. Southern California Coastal
California gull	Bird		Adult	Mortality	0.404	NA	Ingestion	Brain	1977. Young, D.R., and T.C. Heeson. Coastal Water Research Program Annual Report. Southern California Coastal
California gull	Bird		Adult	Mortality	0.829	NA	Ingestion	Breast	1977. Young, D.R., and T.C. Heeson. Coastal Water Research Program Annual Report. Southern California Coastal
California gull	Bird		Adult	Mortality	1.08	NA	Ingestion	Liver	1977. Young, D.R., and T.C. Heeson. Coastal Water Research Program Annual Report. Southern California Coastal
Tree Swallow	Bird		Adult	Reproduction	0.84	ED13		Blood	2008. Brasso RL, DA Cristol. Ecotoxicology 17:133-141
Tree Swallow	Bird		Adult	Reproduction	0.84	ED21		Blood	2008. Brasso RL, DA Cristol. Ecotoxicology 17:133-141

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Table E-5. Effects Based Tissue Concentrations for Birds - PCBs

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Bald eagle	Bird		Egg	Survival	4	NOED	NS	Eggs	2003. Connell DW, CN Fung, TB Minh, S Tanabe, PKS Lam, BSF Wong, MHW Lam, LC Wong, RSS Wu, BJ Richardson. Wat. Res. 37:459-467
Blact-crowned night-heron	Bird		Egg	Reproduction	10.9	ED	NS	Eggs	2003. Connell DW, CN Fung, TB Minh, S Tanabe, PKS Lam, BSF Wong, MHW Lam, LC Wong, RSS Wu, BJ Richardson. Wat. Res. 37:459-467
Brown pelican	Bird		Egg	Reproduction	7.94	NOED	Combined	Eggs	1974. Blus LJ, BS Neely, Jr., AA Belisle, RM Prouty. Environ Pollut 007:81-91
Chicken	Bird		Egg	Survival	0.36	NOED	NS	Eggs	2003. Connell DW, CN Fung, TB Minh, S Tanabe, PKS Lam, BSF Wong, MHW Lam, LC Wong, RSS Wu, BJ Richardson. Wat. Res. 37:459-467
Common Starling	Bird			Reproduction	52	NOED			2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621
Common tern	Bird		Juvenile	Reproduction	75.1	ED75	Combined	Eggs	2003. Hart CA, ICT Nisbet, SW Kennedy, ME Hahn. Ecotoxicology 12:125-140
Great Blue Heron	Bird		Egg	Reproduction	13	NOED	NS	Eggs	2003. Harris, ML, JE Elliiott, RW Butler, LK Wilson. Environ Pollut 121:207-227
Great Blue Heron	Bird		Egg	Reproduction	33	NOED	NS	Eggs	2003. Harris, ML, JE Elliiott, RW Butler, LK Wilson. Environ Pollut 121:207-227
Great Blue Heron	Bird		Egg	Survival	0.25	NOED	NS	Eggs	2003. Connell DW, CN Fung, TB Minh, S Tanabe, PKS Lam, BSF Wong, MHW Lam, LC Wong, RSS Wu, BJ Richardson. Wat. Res. 37:459-467
Herring gull	Bird			Reproduction	0.1	NOED			2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621
Herring gull	Bird			Reproduction	96	NOED			2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621
Herring gull	Bird			Reproduction	0.5	NOED			2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621
Mallard	Bird			Reproduction	23.3	NOED			2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621
Mallard	Bird			Reproduction	105	NOED			2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621
Mallard	Bird		Egg	Survival	23.3	NOED	NS	Eggs	2003. Connell DW, CN Fung, TB Minh, S Tanabe, PKS Lam, BSF Wong, MHW Lam, LC Wong, RSS Wu, BJ Richardson. Wat. Res. 37:459-467
Osprey	Bird		Egg	Reproduction	3.29	NOED	NS	Eggs	2001. Clark, K.E., W. Stansley, L.J. Niles. Arch Environ Contam Toxicol 40:277-284
Osprey	Bird		Egg	Reproduction	1.65	NOED	Combined	Eggs	2003. Martin PA, S.R de Solla, P Ewins. Ecotoxicology 12:209-224
Osprey	Bird		Egg	Reproduction	3.505	NOED	Combined	Eggs	2003. Martin PA, S.R de Solla, P Ewins. Ecotoxicology 12:209-224
Osprey	Bird		Egg	Reproduction	3.702	NOED	Combined	Eggs	2003. Martin PA, S.R de Solla, P Ewins. Ecotoxicology 12:209-224
Osprey	Bird		Egg	Reproduction	4.528	NOED	Combined	Eggs	2003. Martin PA, S.R de Solla, P Ewins. Ecotoxicology 12:209-224
Osprey	Bird		Egg	Reproduction	7.089	NOED	Combined	Eggs	2003. Martin PA, S.R de Solla, P Ewins. Ecotoxicology 12:209-224
Osprey	Bird		Egg	Reproduction	0.00686	NOED	Combined	Plasma	2003. Martin PA, S.R de Solla, P Ewins. Ecotoxicology 12:209-224
Osprey	Bird		Egg	Reproduction	0.0599	NOED	Combined	Plasma	2003. Martin PA, S.R de Solla, P Ewins. Ecotoxicology 12:209-224
Osprey	Bird		Egg	Reproduction	0.0998	NOED	Combined	Plasma	2003. Martin PA, S.R de Solla, P Ewins. Ecotoxicology 12:209-224
Osprey	Bird		Egg	Reproduction	0.033	NOED	Combined	Plasma	2003. Martin PA, S.R de Solla, P Ewins. Ecotoxicology 12:209-224
Osprey	Bird		Egg	Reproduction	0.203	NOED	Combined	Plasma	2003. Martin PA, S.R de Solla, P Ewins. Ecotoxicology 12:209-224
Osprey	Bird		Egg	Reproduction	0.0747	NOED	Combined	Plasma	2003. Martin PA, S.R de Solla, P Ewins. Ecotoxicology 12:209-224
Snowy egret	Bird		Egg	Survival	0.07	NOED	NS	Eggs	2003. Connell DW, CN Fung, TB Minh, S Tanabe, PKS Lam, BSF Wong, MHW Lam, LC Wong, RSS Wu, BJ Richardson. Wat. Res. 37:459-467
Tree Swallow	Bird		Adult	Reproduction	20	LOED	Ingestion	Eggs	2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621
Tree Swallow	Bird		Adult	Reproduction	50	LOED	Ingestion	Eggs	2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621
Tree Swallow	Bird			Reproduction	1.9	NOED			2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621
Tree Swallow	Bird			Reproduction	3.3	NOED			2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621
Tree Swallow	Bird			Reproduction	0.9	NOED			2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621
Tree Swallow	Bird			Reproduction	11.2	NOED			2003. Custer CM, TW Custer, PM Dummer, KL Munney. Environ Tox & Chem 22:1605-1621

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Table E-6. Effects Based Tissue Concentrations for Birds - Selenium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
American avocet	Bird		Embryo	Growth	9	NS	NS	Eggs	2002. Hoffman DJ. Aquat Toxicol 57:11-26
American coot	Bird		Adult	Mortality	7.44	LD15	NS	Liver	1986. Ohlendorf HM, DJ Hoffman, MK Saiki, TW Aldrich. Sci Total Environ 52:49-63
American coot	Bird		Adult	Mortality	10.8	LD15	NS	Eggs	1986. Ohlendorf HM, DJ Hoffman, MK Saiki, TW Aldrich. Sci Total Environ 52:49-63
American coot	Bird		Adult	Reproduction	7.44	ED9	NS	Liver	1986. Ohlendorf HM, DJ Hoffman, MK Saiki, TW Aldrich. Sci Total Environ 52:49-63
American coot	Bird		Adult	Reproduction	10.8	ED9	NS	Eggs	1986. Ohlendorf HM, DJ Hoffman, MK Saiki, TW Aldrich. Sci Total Environ 52:49-63
Black-crowned night-heron	Bird		NS	Growth	3.3	NS	NS	Eggs	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Black-crowned night-heron	Bird		NR	NR	16.5 (dry wt)	NOAEL	Ingestion	Eggs	1988. Smith GJ, GH Heinz, DJ Hoffman, JW Spann, AJ Krynitsky. Lake Reserv Manage 4:175-180
Chicken	Bird		NS	Mortality	6.53	LD50	NS	Eggs	2002. Spallholz JE, DJ Hoffman. Aquat Toxicol 57:27-37
Chicken	Bird		NS	Mortality	15.7	LD50	NS	Eggs	2002. Spallholz JE, DJ Hoffman. Aquat Toxicol 57:27-37
Herring gull	Bird		Egg	Reproduction	1.1	NOED	Combined	Eggs	2005. Harding LE, M Graham, D Paton. Arch Environ Contam Toxicol 48:414-423
Herring gull	Bird		Egg	Reproduction	1.1	NOED	Combined	Eggs	2005. Harding LE, M Graham, D Paton. Arch Environ Contam Toxicol 48:414-423
Herring gull	Bird		Egg	Reproduction	1.1	NOED	Combined	Eggs	2005. Harding LE, M Graham, D Paton. Arch Environ Contam Toxicol 48:414-423
Japanese quail	Bird		Adult	Mortality	4.4	NS	Water	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Egg	Reproduction	2.3	EC10	NR	Eggs	2008. Beckon WN, C Parkins, A Maximovich, AV Beckon. Environ Sci Toxicol 42:1308-1314
Mallard	Bird		Egg	Reproduction	9 (dry wt)	EC8.2	NR	Eggs	2005. Lam JCW, S Tanabe, MHW Lam, PKS Lam. Environ Pollut 135:481-490
Mallard	Bird		Egg	Reproduction	12 (dry wt)	EC10	NR	Eggs	2003. Ohlendorf HM. In Handbook of Ecotoxicology, 2nd Edition, Boca Raton, FL, CRC. p.465-500
Black-necked stilt	Bird		Egg	Reproduction	14 (dry wt)	EC11.8	NR	Eggs	2005. Lam JCW, S Tanabe, MHW Lam, PKS Lam. Environ Pollut 135:481-490
Mallard	Bird		Immature	Growth	15	NOED	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	9	NOED	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Adult	Growth	3.7	NOED	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	2.8	NOED	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Adult	Growth	3.5	NOED	Ingestion	Eggs	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	5	NOED	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	3.2	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Growth	2.8	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Growth	68	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Growth	10.8	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Growth	11.6	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Growth	14.9	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Growth	26	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Growth	49	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Growth	56	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Growth	72	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Growth	29	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Growth	26	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	3.2	NS	Water	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	25	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	49	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	22	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	16	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Adult	Growth	6.2	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	25	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Adult	Growth	7.1	NS	Ingestion	Eggs	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	27	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Growth	13	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Adult	Mortality	5.72	LD3	NS	Eggs	1986. Ohlendorf HM, DJ Hoffman, MK Saiki, TW Aldrich. Sci Total Environ 52:49-63
Mallard	Bird		Adult	Mortality	5.72	LD32	NS	Liver	1986. Ohlendorf HM, DJ Hoffman, MK Saiki, TW Aldrich. Sci Total Environ 52:49-63
Mallard	Bird		Immature	Mortality	20	NOED	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Mortality	11	NOED	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Mortality	9.9	NOED	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Mortality	19	NOED	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Mortality	56	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Mortality	55	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Mortality	72	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Mortality	20	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Adult	Reproduction	5.72	ED4	NS	Liver	1986. Ohlendorf HM, DJ Hoffman, MK Saiki, TW Aldrich. Sci Total Environ 52:49-63
Mallard	Bird		Adult	Reproduction	5.72	ED4	NS	Eggs	1986. Ohlendorf HM, DJ Hoffman, MK Saiki, TW Aldrich. Sci Total Environ 52:49-63

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Table E-6. Effects Based Tissue Concentrations for Birds - Selenium

Species	Class	Water Type	Life Stage	Effect	Concentration (mg/kg ww)	Endpoint	Exposure Route	Body Part	Citation
Mallard	Bird		NS	Reproduction	0.5	NS	NS	Eggs	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		NS	Reproduction	1.3	NS	NS	Eggs	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		NS	Reproduction	4.6	NS	NS	Eggs	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Adult	Reproduction	9.1	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Adult	Reproduction	31	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Adult	Reproduction	37	NS	Ingestion	Eggs	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Adult	Reproduction	6	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Adult	Reproduction	34	NS	Ingestion	Liver	2004. SJ Hamilton. Sci Total Environ 326:1-31
Mallard	Bird		Immature	Survival	2.8	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Survival	68	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Survival	49	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Survival	56	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Survival	72	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Mallard	Bird		Immature	Survival	29	NS	NS	Liver	2002. Hoffman DJ. Aquat Toxicol 57:11-26
Pacific Common Eider	Bird		Adult	Reproduction	6.96	ED07	NS	Blood	2007. Wilson HM, PL Flint, AN Powell. Environmental toxicology and Chemistry 26(7):1410-1417
Pacific Common Eider	Bird		Adult	Reproduction	24.8	ED50	NS	Blood	2007. Wilson HM, PL Flint, AN Powell. Environmental toxicology and Chemistry 26(7):1410-1417
Spotted sandpiper	Bird		Egg	Reproduction	2.2	ED15	Combined	Eggs	2005. Harding LE, M Graham, D Paton. Arch Environ Contam Toxicol 48:414-423
Spotted sandpiper	Bird		Egg	Reproduction	2.2	NOED	Combined	Eggs	2005. Harding LE, M Graham, D Paton. Arch Environ Contam Toxicol 48:414-423
Spotted sandpiper	Bird		Egg	Reproduction	2.2	NOED	Combined	Eggs	2005. Harding LE, M Graham, D Paton. Arch Environ Contam Toxicol 48:414-423
Spotted sandpiper	Bird		Egg	Reproduction	2.2	NOED	Combined	Eggs	2005. Harding LE, M Graham, D Paton. Arch Environ Contam Toxicol 48:414-423

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Table E-7. Acronyms for Effects Based Tissue Concentrations for Birds

ECXX = effect concentration for XX% of test population
EDXX = effect dose for XX% of test population
IPXX = undefined
kg = kilogram
LCXX = concentration lethal to XX% of test population
LDXX = dose lethal to XX% of test population
LOED = lowest observable effect dose
mg = milligram
NA = not applicable
NOED = no observable effect dose
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
ww = wet weight

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Appendix F

Exposure Pathways – Mammals

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Aluminum																						
Reproduction																						
Aluminum chloride	NR	Mouse (*Mus musculus*)	19.3	mg/kg/d	DR	3	generation	NR	NR	MU	both	GREP	WO	1.93	19.3	Yes	0.03	NR	NR	1.93	19.3	Ondreicka et al, 1966
Antimony																						
Reproduction																						
antimony trichloride	53.38	Rat (*Rattus norvegicus*)	0/1/10	mg/L	DR	31	days	NR	NR	GE	female	PRWT	WO	1.0	10	Yes	0.33	No	3.65E-02	0.0590	0.590	Rossi et al., 1987
Growth																						
antimony potassium tartrate	100	Rat (*Rattus norvegicus*)	0/5	mg/L	DR	725	days	21	days	JV	male	BDWT	WO	5		Yes	0.475	No	5.10E-03	0.533		Shroeder et al., 1970
antimony potassium tartrate	100	Mouse (*Mus musculus*)	0/5	mg/L	DR	519	days	21	days	JV	both	BDWT	WO	5		Yes	0.0531	No	7.10E-03	0.664		Kanisawa and Schroeder, 1969
potassium antimony tartrate	100	Rat (*Rattus norvegicus*)	0/0.06/0.56/5.58/42.17	mg/kg bw/d	DR	13	weeks	7	weeks	JV	male	BDWT	WO	5.58	42.16	Yes	0.375	No	4.10E-02	5.60	42.00	Poon et al., 1998
antimony potassium tartrate	39.67	Rat (*Rattus norvegicus*)	0/16/28/59/94/168	mg/kg bw/d	DR	14	days	8	weeks	JV	both	BDWT	WO	168		Yes	0.184	Yes	1.19E-02	67.0		Dieter, 1992
antimony potassium tartrate	39.67	Mouse (*Mus musculus*)	0/59/98/174/273/407	mg/kg bw/d	DR	14	days	8	weeks	JV	female	BDWT	WO	273	407	Yes	0.024	Yes	2.10E-03	106	161	Dieter, 1992
antimony trioxide	83.53	Rat (*Rattus norvegicus*)	0/84/421/1686	mg/kg bw/d	FD	90	days	NR	NR	AD	male	BDWT	WO	1686		Yes	0.491	No	3.83E-02	1410		Hext et al., 1999
antimony trichloride	53.38	Rat (*Rattus norvegicus*)	0/1/10	mg/L	DR	20	days	NR	NR	GE	female	BDWT	WO		1	Yes	0.33	No	3.65E-02		0.0590	Rossi et al., 1987
antimony potassium tartrate	100	Mouse (*Mus musculus*)	0/5	mg/L	DR	339	days	21	days	JV	female	BDWT	WO		5	Yes	0.043	No	5.80E-04		0.678	Shroeder et al., 1968
Survival																						
potassium antimony tartrate	100	Rat (*Rattus norvegicus*)	0/0.06/0.64/6.13/45.69	mg/kg bw/d	DR	13	weeks	NR	NR	IM	female	MORT	WO	46		Yes	0.136	No	1.64E-02	46.0		Poon et al., 1998
antimony trioxide	100	Short-tailed vole (*Microtus agrestis*)	0/500	mg/kg diet	FD	60	days	35	days	NR	male	MORT	WO	500		No	0.04	No	4.87E-03	60.9		Ainsworth et al., 1991
antimony potassium tartrate	39.67	Rat (*Rattus norvegicus*)	0/16/28/59/94/168	mg/kg bw/d	DR	14	days	8	weeks	JV	both	SURV	WO	168		No	0.184	Yes	1.19E-02	66.6		Dieter, 1992
antimony potassium tartrate	39.67	Mouse (*Mus musculus*)	0/59/98/174/273/407	mg/kg bw/d	DR	14	days	8	weeks	JV	male	MORT	WO	273	407	No	0.0316	Yes	6.00E-03	108	161	Dieter, 1992
antimony trioxide	83.53	Short-tailed vole (*Microtus agrestis*)	0/500/6700	mg/kg diet	FD	21	days	NR	NR	NR	NR	MORT	WO	6700		No	0.043	No	5.17E-03	673		Ainsworth et al., 1991
antimony trioxide	100	Mouse (*Mus musculus*)	0/500/6700	mg/kg diet	FD	18	days	NR	NR	NR	NR	MORT	WO	6700		No	0.0375	No	4.62E-03	826		Ainsworth et al., 1991
antimony trioxide	83.53	Rat (*Rattus norvegicus*)	0/84/421/1686	mg/kg bw/d	FD	90	days	NR	NR	AD	male	MORT	WO	1686		Yes	0.491	No	3.83E-02	1410		Hext et al., 1999
antimony trioxide	100	Short-tailed vole (*Microtus agrestis*)	0/20000	mg/kg diet	FD	12	days	35	days	NR	male	MORT	WO	20000		Yes	0.04	No	4.87E-03	2440		Ainsworth et al., 1991
potassium antimony tartrate	100	Rat (*Rattus norvegicus*)	0/5	mg/L	DR	784	days	21	days	JV	female	TDTH	WO		5	Yes	0.475	No	5.07E-03		0.533	Shroeder et al., 1970
Arsenic																						
Reproduction																						
Arsenite (As^{+3})		Mouse (*Mus musculus*)	5	mg/L	DR	3	generation	NR	NR	MU	NR	PROG	WO	5		yes	0.030	yes	7.50E-03	1.25	0.011	Schroeder and Mitchner, 1971
Barium																						
Reproduction																						
Barium chloride dihydrate	100	Rat (*Rattus norvegicus*)	0/4.3/17/32.9/61.1/120.7	mg/kg bw/d	DR	92	days	43-44	days	JV	male	RHIS	TE	121		Yes	0.307	No	3.42E-02	121		Dietz et al., 1992
Barium chloride dihydrate	100	Mouse (*Mus musculus*)	0/12.4/41.9/82.9/164.7/436.2	mg/kg bw/d	DR	92	days	43-44	days	JV	male	RHIS	TE	165	436	No	0.016	No	2.40E-03	165	436	Dietz et al., 1992
Growth																						
Barium acetate	100	Rat (*Rattus norvegicus*)	0/5	mg/L	DR	520	days	21	days	JV	both	BDWT	WO	5.00		Yes	0.245	No	2.79E-02	0.570		Schroeder and Mitchener, 1975
Barium chloride	100	Rat (*Rattus norvegicus*)	0/4.714	mg/org/d	FD	29	days	NR	NR	JV	male	BDWT	WO	4.70		No	0.267	No	2.32E-02	16.5		Stoewsand et al., 1988
Barium chloride dihydrate	100	Rat (*Rattus norvegicus*)	0/4.3/17/32.9/61.1/120.7	mg/kg bw/d	DR	92	days	43-44	days	JV	both	BDWT	WO	61.0	121	Yes	0.340	No	3.75E-02	61.0	121	Dietz et al., 1992
Barium chloride dihydrate	100	Mouse (*Mus musculus*)	0/12.4/41.9/82.9/164.7/436.2	mg/kg bw/d	DR	92	days	43-44	days	JV	male	BDWT	WO	165	436	Yes	0.038	No	5.20E-03	165	436	Dietz et al., 1992
Barium acetate	100	Mouse (*Mus musculus*)	0/5	mg/L	DR	10	days	19-20	days	JV	female	BDWT	WO		5.00	Yes	0.018	No	2.60E-03		0.741	Schroeder and Mitchener, 1975
Survival																						
Barium chloride dihydrate	100	Rat (*Rattus norvegicus*)	0/4.3/17/32.9/61.1/120.7	mg/kg bw/d	DR	92	days	43-44	days	JV	male	MORT	WO	61.0	121	Yes	0.340	No	7.48E-02	61.0	121	Dietz et al., 1992
Barium chloride dihydrate	100	Mouse (*Mus musculus*)	0/12.4/41.9/82.9/164.7/436.2	mg/kg bw/d	DR	13	days	43-44	days	JV	male	MORT	WO	165	436	Yes	0.038	No	5.20E-03	165	436	Dietz et al., 1992
Beryllium																						
Growth																						
Beryllium sulfate	8.58	Rat (*Rattus norvegicus*)	0/100	mg/L	DR	91	days	NR	NR	SM	female	BDWT	WO	100		No	0.315	No	3.50E-02	0.953		Freundt and Irbahim, 1990
Beryllium sulfate	100	Rat (*Rattus norvegicus*)	0/5	mg/L	DR	39	days	21	days	JV	male	BDWT	WO		5.00	Yes	0.090	No	1.10E-02		0.630	Schroeder and Mitchener, 1975
Beryllium sulfate	100	Mouse (*Mus musculus*)	0/5	mg/L	DR	70	days	19-20	days	JV	female	BDWT	WO		5.00	Yes	0.024	No	3.50E-03		0.718	Schroeder and Mitchener, 1975
Survival																						
Beryllium sulfate	100	Rat (*Rattus norvegicus*)	0/5	mg/L	DR	1464	days	21	days	JV	both	LFSP	WO	5		Yes	0.486	No	5.20E-02	0.532		Schroeder and Mitchener, 1975
Boron																						
Reproduction																						
Boric acid		Rat (*Rattus norvegicus*)	117/350/1170	ppm	FD	3	generation	NR	NR	AD	NR	GREP	WO	350		yes	0.35	yes	2.80E-02	28	93.6	Weir and Fisher, 1972
Cadmium																						
Reproduction																						
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/5.5/6.9	ug/kg bw/d	FD	64	weeks	NR	NR	GE	both	PROG	WO	6.90		Yes	0.34	No	2.83E-02	0.00690		Wills et al 1981
Cadmium chloride	100	Mouse (*Mus musculus*)	0/1.48//242.7/39806	ug/L	DR	60	days	8	weeks	GE	female	PRWT	WO	243	39806	No	0.0225	Yes	8.80E-03	0.0939	15.6	Webster, 1988
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/220/1650/2860	ug/org/d	DR	14	days	NR	NR	GE	female	PRWT	WO	220	1650	No	0.338	Yes	4.40E-02	0.651	4.88	Sorell and Braziano, 1990
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/4.0/7.6/10.1/15.9	ug/g diet	FD	57	days	NR	NR	JV	male	TEWT	TE	15.9		No	0.2304	Yes	1.29E-02	0.890		Combs et al., 1983
Cadmium chloride	100	Mouse (*Mus musculus*)	0/10/20/60	ug/g diet	FD	6	days	NR	NR	GE	female	DEYO	WO	10.0	20.0	No	0.0575	No	6.57E-03	1.14	2.28	Sawicka-Kapusta et al 1994
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/0.07/0.53/1.52	mg/d	DR	21	days	NR	NR	GE	female	PRWT	WO	0.530	1.52	No	0.338	No	3.73E-02	1.57	4.50	Ahokas et al 1980
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/1/3/10/30	mg/kg diet	FD	3	month	NR	NR	JV	both	SPCL	SM	30.0		Yes	0.315	No	2.66E-02	2.53		Loeser and Lorke 1977
Cadmium chloride	61.32	Rat (*Rattus norvegicus*)	0/8.8/88	mg/kg bw/d	FD	3	month	NR	NR	JV	male	TEWT	TE	8.80	88.0	Yes	0.00031	No	8.88E-05	5.40	54.0	Zielinska-Psuja et al., 1979
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/0.69/1.5/2.5	mg/org/d	DR	21	days	5	months	GE	female	PRWT	WO	1.50	2.50	Yes	0.25	No	2.84E-02	6.00	10.0	Sasser et al., 1985
cadmium chloride	100	Rat (*Rattus norvegicus*)	0/0.41/1.09/2.82	mg/d	DR	24	weeks	70	days	JV	male	PRFM	WO	2.82		Yes	0.438	Yes	2.82E-02	6.44		Kotsonis and Klassen, 1978
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/17.2/34.4/68.8	mg/L	DR	11	weeks	100	days	JV	male	SPCL	SM	68.8		Yes	0.431	No	4.64E-02	7.41		Zenick et al 1982
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50/100	mg/L	DR	40	days	NR	NR	AD	male	TEWT	TE	100		Yes	0.25	No	2.84E-02	11.4		Caflisch, 1994
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/1.2/3.5/12.5	mg/kg bw	FD	9	days	4	months	GE	female	FERT	WO	12.5		Yes	0.382	Yes	3.36E-02	12.5		Machemer and Lorke, 1981
Cadmium chloride	100	Mouse (*Mus musculus*)	0/5.0/50.0	mg/kg diet	FD	252	days	68	days	GE	female	PROG	WO		5.00	Yes	0.0252	No	3.33E-03		0.661	Whelton et al., 1988
Cadmium chloride	100	Mouse (*Mus musculus*)	0/10/20/40	mg/L	DR	19	days	NR	NR	GE	female	PRWT	WO		10.0	Yes	0.051	No	6.80E-03		1.42	Webster, 1978
Cadmium	100	Mouse (*Mus musculus*)	0/10	mg/L	DR	6	month	21	days	JV	female	DEYO	WO		10.0	No	0.0225	No	3.26E-03		1.45	Schroeder and Mitchener, 1971
Cadmium chloride hydrate	100	Bank vole (*Clethrionomys glareolus*)	0/15/40	ug/g diet	FD	6	month	5	months	JV	male	SPCL	TE		15.0	Yes	0.035	No	4.37E-03		1.87	Swiergosz et al 1998
Cadmium	100	Rat (*Rattus norvegicus*)	0/17200	ug/L	DR	111	days	NR	NR	GE	female	PRWT	WO		17200	Yes	0.1	No	1.25E-02		2.14	Hastings et al., 1978
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50	mg/L	DR	170	days	NR	NR	GE	female	PRWT	WO		50.0	Yes	0.2798	Yes	2.20E-02		3.93	Steibert et al., 1984
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/40	mg/L	DR	25	days	2	weeks	JV	both	TEWT	TE		40.0	No	0.217	No	2.50E-02		4.61	Mallol et al., 1984
Cadmium chloride	100	Mouse (*Mus musculus*)	0/40	mg/L	DR	19	days	NR	NR	GE	female	PRWT	WO		40.0	Yes	0.032	No	4.47E-03		5.59	Webster, 1979
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50	mg/L	DR	170	days	7	weeks	JV	female	PRWT	WO		50.0	Yes	0.1983	No	2.31E-02		5.82	Steibert et al., 1984

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Cadmium acetate	100	Rat (*Rattus norvegicus*)	0/6.3	mg/kg bw/d	DR	28	days	NR	NR	GE	female	PRWT	WO		6.30	Yes	0.18	No	2.12E-02		6.30	Gupta et al., 1993
Cadmium acetate	100	Rat (*Rattus norvegicus*)	0/2.140	mg/org/d	DR	120	days	NR	NR	JV	male	SPCL	TE		2.14	Yes	0.294	No	3.29E-02		7.28	Saxena, et.al. 1989
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/200	mg/kg diet	FD	21	days	12	weeks	GE	female	PRWT	WO		200	Yes	0.2046	Yes	1.72E-02		236	Pond and Walker, 1975
Growth																						
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/5.5/6.9	ug/kg bw/d	FD	64	weeks	NR	NR	JV	both	BDWT	WO	6.90		Yes	0.602	No	4.53E-02	0.0069		Wills et al 1981
Cadmium acetate	100	Cattle (*Bos taurus*)	0/1.2	mg/kg diet	FD	330	days	NR	NR	JV	male	BDWT	WO	1.20		Yes	500	Yes	3.30E+00	0.00792		Vreman et al., 1988
Cadmium acetate	100	Cattle (*Bos taurus*)	0/1.3	mg/kg diet	FD	328	days	NR	NR	JV	male	BDWT	WO	1.30		Yes	500	Yes	3.40E+00	0.00884		Vreman et al., 1988
Cadmium acetate	100	Cattle (*Bos taurus*)	0/1.8	mg/kg diet	FD	330	days	NR	NR	JV	male	BDWT	WO	1.80		Yes	500	Yes	5.20E+00	0.0187		Vreman et al., 1988
Cadmium chloride	100	Mouse (*Mus musculus*)	0/1.24	ug/org/d	FD	5	weeks	NR	NR	JV	female	BDWT	WO	1.24		Yes	0.02125	Yes	3.43E-03	0.0584		Lind et al., 1997
Cadmium chloride	100	Pig (*Sus scrofa*)	0/0.47/0.86/2.27/4.46	mg/kg diet	FD	128	days	NR	NR	JV	female	BDWT	WO	4.46		Yes	90	Yes	1.60E+00	0.0793		King et al., 1992
Cadmium sulfate	100	Vole (*Microtus pennsylvanicus*)	0/5.09	ug/org/d	FD	40	days	NR	NR	JV	NR	BDWT	WO	5.09		Yes	0.0284	Yes	5.08E-03	0.179		Williams et al 1978
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/0.07/0.53/1.52	mg/d	DR	21	days	NR	NR	GE	female	BDWT	WO	0.07	0.53	No	0.338	No	3.73E-02	0.207	1.57	Ahokas et al 1980
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/5/25	mg/kg diet	FD	14	weeks	NR	NR	JV	male	BDWT	WO	5.00	25.0	Yes	0.385	Yes	2.06E-02	0.268	1.34	Cousins et al 1977
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/2/5	mg/kg diet	FD	11	weeks	NR	NR	JV	male	BDWT	WO	5.00		Yes	0.49	Yes	3.17E-02	0.323		Koo and Winslow, 1983
Cadmium chloride	100	Sheep (*Ovis aires*)	0/10.8/29.4/59.7/111.2	mg/org/d	FD	163	days	4	months	JV	male	BDWT	WO	29.4	59.7	Yes	65.66	Yes	1.99E+00	0.448	0.909	Doyle et al., 1974
Cadmium sulfate	100	Vole (*Microtus pennsylvanicus*)	0/4.93/12.82	ug/org/d	FD	40	days	NR	NR	JV	NR	BDWT	WO	12.82		Yes	0.0268	Yes	4.42E-03	0.478		Williams et al 1978
Cadmium sulfate	100	Vole (*Microtus pennsylvanicus*)	0/16.67	ug/org/d	FD	40	days	NR	NR	JV	NR	BDWT	WO	16.67		Yes	0.0288	Yes	6.04E-03	0.579		Williams et al 1978
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/5/10	mg/L	DR	4	weeks	21	days	JV	female	BDWT	WO	5.00	10.0	No	0.2024	No	2.35E-02	0.581	1.16	Ogoshi et al., 1989
Cadmium	100	Rat (*Rattus norvegicus*)	0/5	mg/L	DR	32	days	28	days	JV	both	BDWT	WO	5		Yes	0.1652	No	1.96E-02	0.593		Schroeder et al., 1963
Cadmium acetate	100	Rat (*Rattus norvegicus*)	0/1/2.5/5/10/25/50	mg/L	DR	24	month	21	days	JV	female	BDWT	WO	10	25	Yes	0.465	Yes	3.00E-02	0.645	1.61	Perry et al., 1977
Cadmium acetate	100	Rat (*Rattus norvegicus*)	0/1/10/100	mg/L	DR	2	weeks	35	days	JV	male	BDWT	WO	10	100	Yes	0.43	Yes	3.31E-02	0.770	7.70	Yuhas et al 1979
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/4.0/7.6/10.1/15.9	ug/g diet	FD	57	days	NR	NR	JV	male	BDWT	WO	15.9		Yes	0.2304	Yes	1.29E-02	0.890		Combs et al., 1983
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/4.0/7.6/10.1/15.9	ug/g diet	FD	57	days	NR	NR	JV	male	BDWT	WO	15.9		Yes	0.2304	Yes	1.29E-02	0.890		Combs et al., 1983
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/10/50/100	mg/kg diet	FD	19	month	NR	NR	JV	male	GMPH	BO	10.0	50.0	Yes	0.1	No	1.04E-02	1.04	5.18	Takashima et al 1980
Cadmium chloride	100	Mouse (*Mus musculus*)	0/5/50	mg/kg diet	FD	252	days	68	days	GE	female	BDWT	WO	5.00	50.0	Yes	0.040	Yes	8.67E-03	1.08	10.8	Bhattacharyya et al., 1988
Cadmium chloride (CdCl2.1H2	100	Dog (*Canis familiaris*)	0/1/3/10/30	mg/kg diet	FD	3	month	4-6	months	JV	both	BDWT	WO	30.0		Yes	10.5	No	4.75E-01	1.36		Loeser and Lorke, 1977
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/15	mg/L	DR	36	days	27	days	JV	female	BDWT	WO	15.0		Yes	0.164	No	1.95E-02	1.78		Sugawara and Sugawara, 1983
Cadmium	100	Rat (*Rattus norvegicus*)	0/18.08	ug/g diet	FD	6	weeks	1	months	JV	NR	BDWT	WO	18.08		Yes	0.10825	No	1.10E-02	1.85		Mitra et al., 1995
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/31.5	mg/L	DR	18	month	28	days	JV	female	BDWT	WO	31.5		Yes	0.341	Yes	2.40E-02	2.22		Mangler et al., 1988
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/1/3/10/30	mg/kg diet	FD	3	month	NR	NR	JV	both	BDWT	WO	30.0		Yes	0.315	No	2.66E-02	2.53		Loeser and Lorke 1977
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/0.5/2.0/5.0	mg/d	FD	2	weeks	5	weeks	JV	male	BDWT	WO	0.500	2.00	Yes	0.189	Yes	1.34E-02	2.65	10.6	Yuyama 1982
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/25	mg/L	DR	8	weeks	NR	NR	JV	male	BDWT	WO	25.0		Yes	0.314	No	3.49E-03	2.78		Washko and Cousins 1977
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/8/40/200/600	mg/kg diet	FD	4	days	5	weeks	JV	female	BDWT	WO	40.0	200	No	0.13	Yes	1.00E-02	3.08	15.4	Mitsumori et al., 1998
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50	mg/L	DR	170	days	NR	months	AD	female	BDWT	WO	50.0		Yes	0.2798	Yes	2.09E-02	3.73		Steibert et al., 1984
Cadmium chloride	100	Pig (*Sus scrofa*)	0/50/150/450/1350	mg/kg diet	FD	6	weeks	55	days	JV	male	BDWT	WO	50.0	150	Yes	13.72	Yes	1.11E+00	4.05	12.1	Cousins et al., 1973
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/25/50/100	mg/kg diet	FD	4	weeks	NR	NR	JV	male	BDWT	WO	50.0	100	Yes	0.2631	No	2.29E-02	4.36	8.71	Chetty et al., 1980
Cadmium chloride	100	Mouse (*Mus musculus*)	0/3/30/300	mg/L	DR	70	days	28	days	JV	NR	BDWT	WO	30.0	300	Yes	0.018	No	2.66E-03	4.44	44.4	Koller and Roan, 1977
Cadmium chloride	100	Mouse (*Mus musculus*)	0/0.38/1.34/5.62/6.14/149	ug/org/d	FD	2	year	7	weeks	AD	female	BDWT	WO	149		Yes	0.03	Yes	3.20E-03	4.97		Watanabe et al., 1986
Cadmium chloride hydrate	100	Bank vole (*Clethrionomys glareolus*)	0/15/40	ug/g diet	FD	6	month	5	months	JV	male	BDWT	WO	40.0		Yes	0.035	No	4.37E-03	4.99		Swiergosz et al 1998
Cadmium chloride	61.32	Rat (*Rattus norvegicus*)	0/8.8/88	mg/kg bw/d	FD	3	month	NR	NR	JV	male	BDWT	WO	8.80	88.0	Yes	0.306	No	2.60E-02	5.40	54.0	Zielinska-Psuja et al., 1979
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50	mg/L	DR	330	days	27	days	JV	female	BDWT	WO	50.0		Yes	0.327	No	3.62E-02	5.54		Sugawara and Sugawara, 1983
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50/100/250/500/750/1000	mg/kg diet	FD	21	days	NR	NR	JV	male	BDWT	WO	100	250	No	0.267	Yes	1.62E-02	6.06	15.2	Gustafson and Mercer, 1984
Cadmium chloride	100	Mouse (*Mus musculus*)	0/5000/10000/50000	ug/L	DR	3	weeks	6	weeks	JV	female	BDWT	WO	50000		No	0.0225	No	3.26E-03	7.23		Blakely, 1984
Cadmium chloride	100	Rat (Rattus norvegicus)	0/17.2/34.4/68.8	mg/L	DR	80	days	100	days	JV	male	BDWT	WO	68.8		Yes	0.446	No	4.79E-02	7.38		Zenick et al 1982
Cadmium acetate	100	Mouse (*Mus musculus*)	0/0.019/0.095/0.186	mg/org/d	FD	3	weeks	NR	NR	JV	both	BDWT	WO	0.186		Yes	0.0218	Yes	5.57E-03	8.53		Weber and Reid 1969
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/10/20/40/80/160	mg/L	DR	4	weeks	24	weeks	AD	NR	BDWT	WO	80.0	160	No	0.4702	No	5.02E-02	8.54	17.1	Ogoshi et al., 1989
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/0.52/106	mg/kg diet	FD	5	month	3	weeks	JV	male	BDWT	WO	106		Yes	0.39	No	3.17E-02	8.61		Tanaka et al 1995
Cadmium chloride	100	Bank vole (*Clethrionomys glareolus*)	0/5000/10500	ug/kg bw/d	FD	6	weeks	1	months	JV	male	BDWT	WO	10500		Yes	1.01	Yes	2.90E-03	10.5		Wlostowski et al., 2000
Cadmium chloride	100	Mouse (*Mus musculus*)	0/0.48/1.78/1.75/47.1	mg/kg diet	FD	2	year	10	weeks	GE	female	BDWT	WO	47.1		Yes	0.032	Yes	8.00E-03	11.8		Watanabe et al., 1986
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/1.2/3.5/12.5	mg/kg bw	FD	9	days	4	months	GE	female	BDWT	WO	12.5		No	0.382	No	3.11E-02	12.5		Machemer and Lorke, 1981
Cadmium chloride	100	Dog (*Canis familiaris*)	0/1/3/10/50/100	mg/d	FD	250	weeks	8	months	JV	both	GMPH	BO	100		Yes	8	No	3.80E-01	12.5		Kodama et al., 1989
Cadmium chloride	100	Bank vole (*Clethrionomys glareolus*)	0/40/80	ug/g diet	FD	6	weeks	1	months	JV	male	BDWT	WO	80		Yes	0.0159	Yes	2.50E-03	12.6		Wlostowski and Krasowska, 1999
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/80/160	mg/L	DR	4	weeks	2	year	AD	NR	GMPH	FM	160		No	0.05401	No	5.40E-02	16.9		Ogoshi et al., 1989
Rock phosphate	100	Pig (*Sus scrofa*)	0/0.61/1.20	mg/kg diet	FD	132	days	NR	NR	JV	female	BDWT	WO	1.20		Yes	0.09	Yes	1.62E+00	21.3		King et al., 1992
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/100	mg/kg diet	FD	61	days	50	days	JV	male	BDWT	WO	100		Yes	0.0002	No	6.26E-05	31.3		Nation et al., 1990
Cadmium acetate	100	Mouse (*Mus musculus*)	0/3/30/300/600	mg/L	DR	6	weeks	NR	NR	JV	male	BDWT	WO	300	600	Yes	0.0249	No	3.57E-03	43.0	85.9	Exon et al., 1979
Cadmium chloride	100	Dog (*Canis familiaris*)	0/1/3/10/50/100	mg/kg bw/d	FD	9	year	6-8	months	JV	both	BDWT	WO	50.0	100	Yes	12.9	No	5.62E-01	50.0	100	Hamada et al., 1991
Cadmium	100	Rat (*Rattus norvegicus*)	0/0.85/2.25	ug/g diet	FD	6	weeks	NR	NR	JV	male	BDWT	WO		0.850	Yes	0.257	No	2.25E-02		0.0744	Weigel et al 1987
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/25/50/75	mg/kg diet	FD	180	days	6	weeks	JV	male	BDWT	WO		25.0	Yes	0.4589	No	3.62E-02		1.97	Rajanna et al., 1984
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/30.5	mg/kg diet	FD	7	days	5	weeks	JV	both	BDWT	WO		30.5	Yes	0.130	No	1.28E-02		3.01	Groten et al., 1991
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/0.0031/0.0062/0.0125/0.025/0.05	% in diet	FD	25	days	NR	NR	JV	male	BDWT	WO		0.00310	Yes	0.1	No	1.04E-02		3.21	Wilson et al 1940
Cadmium chloride	100	Pig (*Sus scrofa*)	0/88	ug/g diet	FD	4	weeks	NR	NR	JV	male	BDWT	WO		88.0	Yes	18.73	Yes	7.30E-01		3.43	Osuna and Edds, 1980
Cadmium chloride	100	Pig (*Sus scrofa*)	0/154	mg/kg diet	FD	50	days	NR	NR	JV	NR	BDWT	WO		154	Yes	28.55	Yes	7.20E-01		3.88	Pond et al., 1973
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50	mg/kg diet	FD	14	days	NR	NR	JV	male	BDWT	WO		50.0	Yes	0.13906	Yes	1.13E-02		4.06	Suzuki and Yoshida, 1978
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50/100/200	mg/kg diet	FD	28	days	NR	NR	JV	male	BDWT	WO		50.0	Yes	0.1991	No	1.82E-02		4.58	Suzuki and Yoshida 1979
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50	mg/kg diet	FD	9	days	NR	NR	JV	male	BDWT	WO		50.0	Yes	0.1108	No	1.13E-02		5.08	Suzuki and Yoshida 1978
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50	mg/kg diet	FD	14	days	NR	NR	JV	male	BDWT	WO		50.0	Yes	0.1343	No	1.32E-02		5.18	Suzuki and Yoshida 1979
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/30/60	mg/kg diet	FD	30	days	NR	NR	JV	male	BDWT	WO		30.0	Yes	0.08	Yes	1.45E-02		5.44	Meyer et al 1982
Cadmium chloride	100	Cattle (*Bos taurus*)	0/5.74	mg/kg bw/d	OR	63	days	NR	NR	JV	male	BDWT	WO		5.74	Yes	71.4	Yes	5.10E-02		5.74	Lynch et al., 1976
cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50	mg/L	DR	170	days	7	weeks	JV	female	BDWT	WO		50.0	Yes	0.1983	No	2.31E-02		5.82	Steibert et al., 1984
Cadmium chloride	61.32	Rat (*Rattus norvegicus*)	0/100	mg/L	DR	5	weeks	NR	NR	AD	female	BDWT	WO		100	Yes	0.28	No	3.15E-02		6.89	Freundt and Irbahim, 1990
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/200	ug/g diet	FD	11	weeks	NR	NR	NR	female	BDWT	WO		200	Yes	0.1678	Yes	8.00E-03		9.54	Nakamura et al., 1983
Cadmium chloride dihydrate	100	Rat (*Rattus norvegicus*)	0/100	mg/kg diet	FD	30	days	NR	NR	JV	male	BDWT	WO		100	Yes	0.144	No	1.40E-02		9.70	Banis et al 1969
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/50/100	mg/kg diet	FD	8	weeks	NR	NR	YO	male	GMPH	TB		100	Yes	0.12	No	1.20E-02		10.0	Iguchi and Sano, 1982

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Cadmium chloride dihydrate	100	Rat (*Rattus norvegicus*)	0/100	mg/kg diet	FD	3	weeks	5	weeks	JV	both	BDWT	WO		100	Yes	0.0955	No	9.97E-03		10.4	Banis et al 1969
Cadmium acetate	100	Rat (*Rattus norvegicus*)	0/150	mg/kg diet	FD	16	weeks	NR	NR	JV	male	BDWT	WO		150	Yes	0.25	No	2.20E-02		13.2	Eakin et al 1980
Cadmium chloride	61.32	Rat (*Rattus norvegicus*)	0/200	mg/L	DR	91	weeks	NR	NR	JV	male	BDWT	WO		200	Yes	0.15	No	1.80E-02		14.7	Kajikawa et al 1981
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/200	mg/kg diet	FD	21	days	12	weeks	GE	female	BDWT	WO		200	Yes	0.2046	Yes	1.72E-02		16.8	Pond and Walker, 1975
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/200	mg/kg diet	FD	10	days	NR	NR	JV	male	BDWT	WO		200	Yes	0.100	No	1.04E-02		20.7	Suzuki and Yoshida 1977
Cadmium sulfate	100	Pig (*Sus scrofa*)	0/500	mg/kg diet	FD	2	weeks	NR	NR	JV	male	BDWT	WO		500	Yes	11.7	No	5.19E-01		75.8	Van Vleet et al., 1981
cadmium chloride	100	Shrew (*Sorex araneus*)	0/0.73	mg/d	FD	12	weeks	NR	NR	JV	both	BDWT	WO		0.73	Yes	0.0071	No	1.18E-03		103	Dodds-Smith et al., 1992
Cadmium acetate	100	Mouse (*Mus musculus*)	0/5.71/21.6/9.81	mg/org/d	FD	3	weeks	NR	NR	JV	both	BDWT	WO		5.71	Yes	0.01	Yes	4.14E-03		571	Weber and Reid 1969
Survival																						
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/5.5/6.9	ug/kg bw/d	FD	64	weeks	NR	NR	JV	both	MORT	WO	6.90		Yes	0.602	No	4.53E-02	0.00690		Wills et al 1981
Cadmium chloride	100	Dog (*Canis familiaris*)	0/1/3/10/30	mg/kg diet	FD	3	month	4-6	months	JV	both	MORT	WO	30.0		Yes	10.5	No	4.75E-01	1.36		Loeser and Lorke, 1977
Cadmium chloride hydrate	100	Bank vole (*Clethrionomys glareolus*)	0/15/40	ug/g diet	FD	6	month	5	months	JV	male	MORT	WO	15.0	40	Yes	0.035	No	4.37E-03	1.87	4.99	Swiergosz et al 1998
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/31.5	mg/L	DR	18	month	28	days	JV	female	MORT	WO	31.5		Yes	0.341	Yes	2.40E-02	2.22		Mangler et al., 1988
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/1/3/10/30	mg/kg diet	FD	3	month	NR	NR	JV	both	MORT	WO	30.0		Yes	0.315	No	2.66E-02	2.53		Loeser and Lorke 1977
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/30.5	mg/kg diet	FD	56	days	5	weeks	JV	both	MORT	WO	30.5		Yes	0.29	No	2.48E-02	2.61		Groten et al., 1991
Cadmium chloride	100	Mouse (*Mus musculus*)	0/5.0/50.0	mg/kg diet	FD	252	days	68	days	GE	female	MORT	WO	50.0		Yes	0.0252	No	3.33E-03	6.61		Whelton et al., 1988
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/0.69/1.5/2.5	mg/org/d	DR	21	days	5	months	GE	female	MORT	WO	2.50		Yes	0.25	No	2.84E-02	10.0		Sasser et al., 1985
Cadmium chloride	100	Rat (*Rattus norvegicus*)	0/1.2/3.5/12.5	mg/kg bw	FD	9	days	4	months	GE	female	MORT	WO	12.5		Yes	0.382	No	3.11E-02	12.5		Machemer and Lorke, 1981
Cadmium sulfate	100	Pig (*Sus scrofa*)	0/500	mg/kg diet	FD	10	weeks	NR	NR	JV	male	MORT	WO	500		No	14.8	No	6.29E-01	21.3		Van Vleet et al., 1981
Cadmium chloride	100	Pig (*Sus scrofa*)	0/50/150/450/1350	mg/kg diet	FD	6	weeks	55	days	JV	male	MORT	WO	1350		Yes	13.84	Yes	6.90E-01	67.3		Cousins et al., 1973
Cadmium chloride	100	Shrew (*Sorex araneus*)	0/0.73	mg/d	FD	12	weeks	NR	NR	JV	both	MORT	WO	0.730		Yes	0.0071	No	1.18E-03	103		Dodds-Smith et al., 1992
Cadmium acetate	100	Mouse (*Mus musculus*)	0/5.71/21.6/9.81	mg/org/d	FD	3	weeks	NR	NR	JV	both	MORT	WO	5.71	21.6	Yes	0.01	Yes	4.14E-03	571	2160	Weber and Reid 1969
Cadmium	100	Rat (*Rattus norvegicus*)	0/5	mg/L	DR	6	month	28	days	JV	male	SURV	WO		5.00	Yes	0.3405	No	3.75E-02		0.551	Schroeder et al., 1963
Cadmium	100	Mouse (*Mus musculus*)	0/5	mg/L	DR	18	month	21	days	JV	both	SURV	WO		5.00	No	0.0375	Yes	4.65E-03		0.620	Schroeder et al., 1964
Cadmium chloride	100	Cattle (*Bos taurus*)	0/5.74	mg/kg bw/d	OR	63	days	NR	NR	JV	male	SURV	WO		5.74	Yes	71.4	Yes	5.10E-02		5.74	Lynch et al., 1976
Chlordane (pesticide)																						
Reproduction																						
Chlordane		Mouse (*Mus musculus*)	25, 50, 100	mg/kg	FD	6	generation	NR	NR	NR	NR	GREP	WO	25		Yes	0.030	Yes	5.50E-03	4.58	9	Keplinger et al., 1968
Chromium +3																						
Reproduction																						
Chromium sulfate	38.02	Mouse (*Mus musculus*)	0/100/200/400	mg/kg diet	FD	35	days	21	days	JV	male	SPCL	TE		100	Yes	0.0249	Yes	6.30E-03		9.62	Zahid et al., 1990
Chromium chloride	32.83	Rat (*Rattus norvegicus*)	0/1000	mg/L	DR	12	weeks	NR	NR	AD	male	TEWT	TE		1000	Yes	0.34052	No	3.76E-02		36.2	Bataineh et al., 1997
Chromium chloride	32.83	Mouse (*Mus musculus*)	0/2000/5000	mg/L	DR	12	weeks	50	days	JV	female	PROG	WO		2000	No	0.0342	No	4.75E-03		91.1	Elbetieha and Al-Hamood, 1997
Chromium chloride	32.83	Mouse (*Mus musculus*)	0/5000	mg/L	DR	12	weeks	50	days	JV	male	ORWT	OV		5000	Yes	0.034	No	4.29E-03		228	Elbetieha and Al-Hamood, 1997
Growth																						
Chromium chloride	100	Pig (*Sus scrofa*)	0/0.2	mg/kg diet	FD	32	days	3	weeks	JV	NR	BDWT	WO	0.20		Yes	16.3	Yes	5.40E-01	0.00663		Van Heugten and Spears, 1997
Chromium chloride hexahydrate	100	Cattle (*Bos taurus*)	0/0.4	mg/kg diet	FD	56	days	NR	NR	JV	male	BDWT	WO	0.40		Yes	263.7	Yes	6.15E+00	0.00933		Kegley and Spears, 1995
Chromium chloride hexahydrate	100	Pig (*Sus scrofa*)	0/25200	ug/kg	FD	103	days	NR	NR	JV	both	BDWT	WO	25200		Yes	108.34	Yes	2.56E+00	0.595		Mooney and Cromwell, 1997
Trivalent chromium	100	Rat (*Rattus norvegicus*)	0/5	mg/L	DR	332	days	28	days	JV	male	BDWT	WO	5		Yes	0.4407	No	4.73E-02	0.537		Shroeder et al., 1963
Chromium chloride hexahydrate	100	Pig (*Sus scrofa*)	0/5100/25300	ug/kg	FD	35	days	NR	NR	JV	both	BDWT	WO	25300		Yes	42.58	Yes	1.56E+00	0.927		Mooney and Cromwell, 1997
Chromium chloride	100	Rat (*Rattus norvegicus*)	0/5/25/50/100	mg/kg diet	FD	20	weeks	4	weeks	JV	NR	BDWT	WO	100		Yes	0.4	No	3.24E-02	8.09		Anderson et al., 1997
Chromium sulfate	38.02	Mouse (*Mus musculus*)	0/100/200/400	mg/kg diet	FD	35	days	21	days	JV	male	BDWT	WO	400		Yes	0.0249	Yes	7.30E-03	44.6		Zahid et al., 1990
Chromium chloride	32.83	Mouse (*Mus musculus*)	0/5000	mg/L	DR	12	weeks	50	days	JV	male	BDWT	WO	5000		Yes	0.034	No	4.29E-03	228		Elbetieha and Al-Hamood, 1997
Chromium oxide green	100	Rat (Rattus norvegicus)	0/0.8/1.77	g/kg bw/d	FD	90	days	100	days	SM	female	BDWT	WO	1.77		Yes	0.200	Yes	1.50E-02	1770		Ivanksvic and Preussmann, 1975
Chromium chloride	32.83	Mouse (*Mus musculus*)	0/2000/5000	mg/L	DR	12	weeks	50	days	JV	male	BDWT	WO		2000	Yes	0.03056	No	4.29E-03		92.1	Elbetieha and Al-Hamood, 1997
Survival																						
Chromium chloride hexahydrate	100	Rat (*Rattus norvegicus*)	0/25	mg/L	DR	50	days	23	days	JV	male	MORT	NR		25.0	No	0.267	No	3.02E-02		2.82	Mercado and Bibby 1973
Chromium +6																						
Reproduction																						
Sodium chromate	100	Mouse (*Mus musculus*)	0/1.5	ug/org/d	FD	1	year	NR	NR	JV	male	TEWT	TE	1.50		Yes	0.0466	No	5.53E-03	0.0322		Rao et al., 1983
Sodium chromate	100	Rat (*Rattus norvegicus*)	0/1.8	mg/kg diet	FD	1	year	NR	NR	JV	male	TEWT	TE	1.80		Yes	0.3902	No	3.17E-02	0.146		Rao et al., 1981
Potassium dichromate	35.35	Rat (*Rattus norvegicus*)	0/1/3/6/24	mg/kg bw/d	FD	9	weeks	9	weeks	JV	male	SPCL	TE	24.0		Yes	0.5285	Yes	9.12E-02	8.48		R.O.W. Sciences, Inc.
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/19.4/38.6/85.7	mg/kg bw/d	FD	14	weeks	10	weeks	GE	female	PROG	WO	85.7		Yes	0.03052	Yes	7.02E-03	30.3		R.O.W.Sciences Inc, 1997
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/3/10/21/92	mg/kg bw/d	FD	9	weeks	9	weeks	JV	male	GREP	SM	92.0		Yes	0.02684	Yes	5.46E-03	32.5		R.O.W. Sciences, Inc.
Potassium dichromate	100	Mouse (*Mus musculus*)	0/2.0/3.75/5.47	mg/org/d	DR	8	days	NR	NR	GE	female	PROG	WO	2.0	3.75	Yes	0.04521	No	6.10E-03	44.2	82.9	Junaid et al., 1996
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/1000/2000/4000/5000	mg/l	DR	12	weeks	50	days	JV	male	TEWT	TE	1000	2000	No	0.03080	No	4.48E-03	49.4	98.7	Elbetieha and Al-Hamood, 1997
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/100/200/400	mg/kg diet	FD	35	days	21	days	JV	male	TEDG	TE		100	Yes	0.0249	Yes	7.60E-03		10.8	Zahid et al., 1990
Potassium dichromate	100	Rat (*Rattus norvegicus*)	0/6.44/12.2/15.28	mg/org/d	DR	39	days	120	days	GE	female	PROG	WO		6.44	Yes	0.24002	No	2.74E-02		26.8	Kanojia et al., 1996
Potassium dichromate	100	Rat (*Rattus norvegicus*)	0/5.57/10.18/13.56	mg/org/d	DR	3	month	50	days	JV	female	PRWT	WO		5.57	No	0.168	No	1.99E-02		33.2	Kanojia et al., 1998
Potassium dichromate	100	Mouse (*Mus musculus*)	0/250/500/750	mg/l	DR	6	days	4	months	GE	female	PRWT	WO		250	Yes	0.04537	No	6.12E-03		33.7	Junaid et al., 1995
Potassium dichromate	100	Mouse (*Mus musculus*)	0/250/500/750	mg/L	DR	20	days	90	days	SM	female	GREP	OV		250	Yes	0.03	No	4.22E-03		35.1	Murthy et al., 1996
Potassium dichromate	35.35	Rat (*Rattus norvegicus*)	0/1000	mg/l	DR	12	weeks	NR	NR	AD	male	TEWT	TE		1000	Yes	0.36133	No	3.96E-02		38.7	Bataineh et al., 1997
Potassium dichromate	100	Mouse (*Mus musculus*)	0/1.76/3.6/7.03	mg/org/d	DR	19	days	NR	NR	GE	female	RSEM	WO		1.76	Yes	0.0435	Yes	7.05E-03		40.5	Trivedi et al., 1989
Potassium dichromate	100	Mouse (*Mus musculus*)	0/1.9/3.56/5.23	mg/org/d	DR	20	days	4	months	GE	female	PRWT	WO		1.90	Yes	0.04343	No	5.88E-03		43.7	Junaid et al., 1996
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/2000/5000	mg/l	DR	12	weeks	50	days	JV	male	TEWT	TE		2000	Yes	0.03080	No	4.48E-03		98.7	Elbetieha and Al-Hamood, 1997
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/5000	mg/l	DR	12	weeks	50	days	JV	female	ORWT	OV		5000	Yes	0.03273	No	4.48E-03		246	Elbetieha and Al-Hamood, 1997
Growth																						
Sodium chromate	100	Mouse (*Mus musculus*)	0/1.5	ug/org/d	FD	1	year	NR	NR	JV	male	BDWT	WO	1.50		Yes	0.0466	No	5.53E-03	0.0322		Rao et al., 1983
Sodium chromate	100	Rat (*Rattus norvegicus*)	0/1.8	mg/kg diet	FD	1	year	NR	NR	JV	male	BDWT	WO	1.80		Yes	0.3902	No	3.17E-02	0.146		Rao et al., 1981
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/5/16/34/137	mg/kg bw/d	FD	3	weeks	9	weeks	JV	female	BDWT	WO	16.0	34.0	Yes	0.2036	Yes	5.46E-03	5.66	12.0	R.O.W. Sciences, Inc.
Potassium dichromate	35.35	Rat (*Rattus norvegicus*)	0/1/3/6/24	mg/kg bw/d	FD	9	weeks	9	weeks	JV	male	BDWT	WO	24.0		Yes	0.5285	Yes	9.12E-02	8.48		R.O.W. Sciences, Inc.
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/39.11/79.26/164	mg/kg bw/d	FD	16	weeks	10	weeks	LC	female	BDWT	WO	39.11	79.26	Yes	0.03456	No	4.32E-03	10.5	21.2	R.O.W.Sciences Inc, 1997
Potassium dichromate	100	Rat (*Rattus norvegicus*)	0/5.57/10.18/13.56	mg/org/d	DR	3	month	50	days	JV	female	BDWT	WO	5.57	10.2	Yes	0.168	No	1.99E-02	33.2	60.6	Kanojia et al., 1998
Potassium dichromate	100	Mouse (*Mus musculus*)	0/250/500/750	mg/l	DR	6	days	4	months	GE	female	BDWT	WO	250	500	Yes	0.04537	No	6.12E-03	33.7	67.4	Junaid et al., 1995

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Potassium dichromate	100	Mouse (*Mus musculus*)	0/1.76/3.6/7.03	mg/org/d	DR	19	days	NR	NR	GE	female	BDWT	WO	1.76	3.60	Yes	0.0435	Yes	7.20E-03	40.5	82.8	Trivedi et al., 1989
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/100/200/400	mg/kg diet	FD	35	days	21	days	JV	male	BDWT	WO	400		Yes	0.0249	Yes	7.60E-03	43.2		Zahid et al., 1990
Potassium dichromate	100	Mouse (*Mus musculus*)	0/2.0/3.75/5.47	mg/org/d	DR	8	days	NR	NR	GE	female	BDWT	WO	2.0	3.75	Yes	0.04521	No	6.10E-03	44.2	82.9	Junaid et al., 1996
Potassium dichromate	100	Mouse (*Mus musculus*)	0/1.9/3.56/5.23	mg/org/d	DR	20	days	4	months	GE	female	BDWT	WO	3.56	5.23	Yes	0.04238	No	5.76E-03	84.0	123	Junaid et al., 1996
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/5000	mg/l	DR	12	weeks	50	days	JV	female	BDWT	WO	5000		Yes	0.03273	No	4.48E-03	246		Elbetieha and Al-Hamood, 1997
Potassium dichromate	100	Mouse (*Mus musculus*)	0/5	mg/l	DR	10	days	19-20	days	JV	male	BDWT	WO		5.0	Yes	0.0206	No	3.01E-03		0.730	Schroeder and Mitchener, 1971
Potassium dichromate	100	Rat (*Rattus norvegicus*)	0/7.2/13.1/25.0	mg/kg bw/d	DR	5	days	NR	NR	JV	both	BDWT	WO		7.20	Yes	0.08	Yes	1.57E-02		7.20	Gates et al., 1947
Potassium dichromate	100	Rat (*Rattus norvegicus*)	0/6.44/12.2/15.28	mg/org/d	DR	39	days	120	days	GE	female	BDWT	WO		6.44	Yes	0.24002	No	2.74E-02		26.8	Kanojia et al., 1996
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/2000/5000	mg/l	DR	12	weeks	50	days	JV	male	BDWT	WO		2000	Yes	0.03080	No	4.48E-03		98.7	Elbetieha and Al-Hamood, 1997
Survival																						
Potassium dichromate	35.35	Rat (*Rattus norvegicus*)	0/1/3/6/24	mg/kg bw/d	FD	9	weeks	9	weeks	JV	male	MORT	WO	24.0		Yes	0.5285	Yes	9.12E-02	8.48		R.O.W. Sciences, Inc.
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/19.4/38.6/85.7	mg/kg bw/d	FD	14	weeks	10	weeks	GE	female	MORT	WO	85.7		Yes	0.03052	Yes	7.02E-03	30.3		R.O.W.Sciences Inc, 1997
Potassium dichromate	35.35	Mouse (*Mus musculus*)	0/3/10/21/92	mg/kg bw/d	FD	9	weeks	9	weeks	JV	male	MORT	WO	92.0		Yes	0.02684	Yes	5.46E-03	32.5		R.O.W. Sciences, Inc.
Potassium dichromate	100	Rat (*Rattus norvegicus*)	0/7.2/13.1/25.0	mg/kg bw/d	DR	25	days	NR	NR	JV	both	MORT	WO	25.0		Yes	0.08	Yes	1.34E-02	25.0		Gates et al., 1947
Sodium chromate	100	Rat (*Rattus norvegicus*)	0/0.07/0.7	g/L	DR	28	days	NR	NR	SM	male	MORT	WO	0.70		Yes	0.26	Yes	9.42E-03	25.4		Diaz-Mayans et al., 1986
Potassium dichromate	100	Rat (*Rattus norvegicus*)	0/5.57/10.18/13.56	mg/org/d	DR	3	month	50	days	JV	female	MORT	WO	5.57	10.2	Yes	0.168	No	1.99E-02	33.2	60.6	Kanojia et al., 1998
Potassium dichromate	100	Rat (*Rattus norvegicus*)	0/6.44/12.2/15.28	mg/org/d	DR	39	days	120	days	GE	female	MORT	WO	15.3		Yes	0.24002	No	2.74E-02	63.7		Kanojia et al., 1996
Potassium dichromate	100	Mouse (*Mus musculus*)	0/1.9/3.56/5.23	mg/org/d	DR	20	days	4	months	SM	female	MORT	WO	3.56	5.23	Yes	0.04338	No	5.88E-03	82.1	121	Junaid et al., 1996
Potassium dichromate	100	Mouse (*Mus musculus*)	0/2.0/3.75/5.47	mg/org/d	DR	8	days	NR	NR	GE	female	MORT	WO	5.47		Yes	0.04179	No	5.68E-03	131		Junaid et al., 1996
Potassium dichromate	100	Mouse (*Mus musculus*)	0/1.76/3.6/7.03	mg/org/d	DR	19	days	NR	NR	GE	female	MORT	WO	7.03		Yes	0.043	Yes	7.03E-03	163		Trivedi et al., 1989
Cobalt																						
Reproduction																						
Cobalt chloride	100	Rat (*R. norvegicus*)	0/5/20	mg/kg bw/d	FD	69	days	80	days	MA	male	TEWT	TE	5	20	No	0.00021	No	6.50E-05	5.00	20.0	Nation et al., 1983
Cobalt chloride hexahydrate	45.39	Mouse (*M. musculus*)	0/23/42/72	mg/kg bw/d	DR	13	weeks	12	weeks	SM	male	RSUC	WO		23	Yes	0.0375	No	5.20E-03		10.0	Pedigo et al., 1988
Cobalt chloride hexahydrate	24.9	Mouse (*M. musculus*)	0/400	mg/l	DR	9	weeks	12	weeks	MA	male	TEWT	TE		400	No	0.037	No	5.10E-03		13.7	Anderson et al., 1992
Cobalt chloride hexahydrate	100	Rat (*R. norvegicus*)	0/20	mg/kg bw/d	FD	70	days	100	days	SM	male	TEDG	TE		20	No	0.523	No	4.00E-02		20.0	Corrier et al., 1985
Cobalt	100	Rat (*R. norvegicus*)	0/265	ppm in mg/kg	FD	98	days	100	days	MA	male	TEWT	TE		265	Yes	0.2	No	1.80E-02		24.2	Mollenhauer at al., 1985
Cobalt chloride hexahydrate	100	Mouse (*M. musculus*)	0/43.4	mg/kg bw/d	DR	13	weeks	12	weeks	MA	male	TEWT	TE		43.4	Yes	0.045	No	6.10E-03		43.4	Anderson et al., 1993
Cobalt chloride hexahydrate	100	Mouse (*M. musculus*)	0/400	mg/l	DR	10	weeks	8 to 10	weeks	JV	male	PRFM	WO		400	No	0.0316	No	4.40E-03		55.9	Pedigo et al., 1993
Growth																						
Cobalt nitrate	100	Cow (*Bos taurus*)	0/0.3	mg/kg bw/d	FD	45	days	7	months	JV	female	BDWT	WO	0.3		Yes	99	No	3.00E+00	0.300		Maro et al., 1980
Cobalt chloride hexahydrate	24.9	Rat (*R. norvegicus*)	0/75	ppm in mg/kg	FD	80	days	44	days	JV	male	BDWT	WO	75		Yes	0.47	No	3.70E-02	1.47		Gershbein et al., 1983
Cobalt chloride hexahydrate	100	Pig (*S. scrofa*)	0/25/50/100	mg/kg	FD	16	weeks	NR	NR	NR	NR	BDWT	WO	100		Yes	97.5	Yes	2.35E+00	2.41		Huck and Clawson, 1976
Cobalt chloride hexahydrate	45.39	Mouse (*M. musculus*)	0/23/42/72	mg/kg bw/d	DR	5	weeks	12	weeks	SM	male	BDWT	WO	42	72	Yes	0.0375	Yes	7.80E-03	19.0	33.0	Pedigo at al., 1988
Cobalt sulfate	100	Guinea pig (*Cavia porcellus*)	0/20	mg/kg bw/d	OR	5	weeks	NR	NR	MA	male	BDWT	WO	20		Yes	0.478	No	3.70E-02	20.0		Mohiuddin et al., 1970
Cobalt chloride	100	Rat (*R. norvegicus*)	0/20	mg/kg bw/d	DR	57	days	80	days	JV	male	BDWT	WO	20		Yes	0.347	Yes	3.50E-02	20.0		Bourg et al., 1985
Cobaltous chloride	100	Rat (*R. norvegicus*)	0/10/50/100/200/300	ppm in mg/kg	FD	4	weeks	NR	NR	NR	both	BDWT	WO		10	Yes	0.15	No	1.40E-02		0.963	Chetty et al., 1979
Cobalt chloride	100	Pig (*Sus scrofa*)	0/500	ppm in mg/kg	FD	5	weeks	NR	NR	JV	male	BDWT	WO		500	Yes	19.8	No	8.00E-01		20.2	Van Vleet et al., 1981
Cobaltous chloride hexahydrate	100	Mouse (*M. musculus*)	0/43.4	mg/kg bw/d	DR	13	weeks	12	weeks	MA	male	BDWT	WO		43.4	Yes	0.045	No	6.10E-03		43.4	Anderson et al., 1993
Cobalt chloride	100	Rat (*R. norvegicus*)	1	mg/ml	DR	24	days	NR	NR	JV	male	BDWT	WO		1	Yes	0.1262	No	1.50E-02		122	Derr et al., 1970
Survival																						
Cobalt chloride	100	Pig (*S. scrofa*)	0/500	ppm in mg/kg	FD	10	weeks	NR	NR	JV	male	MORT	NR	500		Yes	25.8	No	9.90E-01	19.3		Van Vleet et al., 1981
Cobalt sulfate	100	Guinea pig (*Cavia porcellus*)	0/20	mg/kg bw/d	OR	5	weeks	NR	NR	MA	male	SURV	WO		20	Yes	0.478	No	3.70E-02		20.0	Mohiuddin et al., 1970
Copper																						
Reproduction																						
Copper sulfate pentahydrate	100	Mink (*Mustela vision*)	0/25/50/100/200	mg/kg diet	FD	357	days	NR	months	JV	female	PROG	WO	50	100	Yes	1.068	No	7.25E-02	3.40	6.79	Aulerich et al 1982
Copper sulfate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	7	days	NR	NR	GE	female	PROG	WO	250		Yes	232	No	6.04E+00	6.51		Thacker, 1991
Copper chloride	100	Mouse (*Mus musculus*)	0/30/100/400	mg/kg diet	FD	19	days	4	months	GE	female	PRWT	WO	400		Yes	0.032	No	4.06E-03	50.7		Webster, 1979
Copper (II) sulfate	39.81	Mouse (*Mus musculus*)	0/0/5/1.0/1.5/2.0/3.0/4.0	g/kg diet	FD	49	days	NR	NR	GE	both	PROG	WO	2	3	Yes	0.0575	No	6.57E-03	90.9	136	Lecyk, 1980
Copper (II) sulfate	39.81	Mouse (*Mus musculus*)	0/0.5/1.0/1.5/2.0/3.0/4.0	g/kg diet	FD	49	days	NR	NR	GE	both	PROG	WO	2	3	No	0.0575	No	6.57E-03	90.9	136	Lecyk, 1980
Copper (II) sulfate pentahydrate	25.45	Rat (*Rattus norvegicus*)	0/500/1000/2000/4000/8000	mg/kg diet	FD	13	weeks	6	weeks	JV	male	SPCL	SM	8000		Yes	0.275	Yes	1.44E-02	107		Hebert 1993
Copper (II) sulfate	39.81	Rat (*Rattus norvegicus*)	0/32/129/259	mg/org/d	FD	92	days	6	weeks	JV	male	SPCL	SM	259		Yes	0.339	No	2.82E-02	304		Hebert et al 1993
Copper (II) sulfate pentahydrate	25.45	Mouse (*Mus musculus*)	0/1000/2000/4000/8000/16000	mg/kg diet	FD	13	weeks	6	weeks	JV	male	SPCL	SM	8000		Yes	0.029	Yes	5.10E-03	358		Hebert 1993
Copper (II) sulfate	39.81	Mouse (*Mus musculus*)	0/173/736/3201	mg/org/d	FD	92	days	6	weeks	JV	male	SPCL	SM	3201		Yes	0.0264	No	3.46E-03	48270		Hebert et al 1993
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	783	days	10	months	GE	female	RSUC	WO		250	Yes	152	Yes	3.35E+00		5.51	Cromwell et al 1993
Copper chloride dihydrate	37.28	Rat (*Rattus norvegicus*)	0/1000	mg/L	DR	12	weeks	NR	NR	AD	male	TEWT	TE		1000	Yes	0.33067	No	3.66E-02		41.2	Bataineh et al., 1998
Growth																						
Copper sulfate	100	Cattle (*Bos taurus*)	0/40	mg/kg diet	FD	239	days	NR	NR	JV	male	BDWT	WO	40		Yes	430	Yes	8.73E+00	0.812		Engle and Spears, 2001
Copper chloride - tribasic	100	Cattle (*Bos taurus*)	0/40	mg/kg diet	FD	154	days	NR	NR	JV	male	BDWT	WO	40		Yes	400.1	Yes	8.52E+00	0.852		Engle et al., 2000
Copper sulfate	100	Cattle (*Bos taurus*)	0/28/55.31	mg/kg diet	FD	112	days	NR	NR	JV	NR	BDWT	WO	55.31		Yes	361.2	No	8.70E+00	1.33		Bailey et al., 2001
Copper sulfate pentahydrate	100	Guinea pig (*Cavia porcellus*)	0/10/20	mg/kg diet	FD	8	weeks	NR	NR	JV	both	BDWT	WO	20		Yes	0.662	No	4.89E-02	1.48		Arthur, 1965
Cupric carbonate	100	Rat (*Rattus norvegicus*)	0/25	ug/g diet	FD	62	days	NR	NR	JV	male	BDWT	WO	25		Yes	0.351	No	2.91E-02	2.07		Uthus, 2001
Copper sulfate	100	Rat (*Rattus norvegicus*)	0/55.1	ug/g diet	FD	5	weeks	NR	NR	JV	male	BDWT	WO	55.1		Yes	0.225	Yes	1.47E-02	3.60		Miranda et al., 1981
Copper sulfate pentahydrate	25.45	Rabbit (*Oryctolagus cuniculus*)	0/75/150/300/450	mg/kg diet	FD	7	weeks	35	days	JV	male	BDWT	WO	450		Yes	2.218	Yes	8.23E-02	4.25		Bassuny, 1991
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/199	mg/kg diet	FD	144	days	31	days	JV	both	BDWT	WO	199		Yes	108	Yes	2.37E+00	4.37		Ward, et al., 1991
copper sulfate pentahydrate	100	Rabbit (*Oryctolagus cuniculus*)	0/100	mg/kg diet	FD	8	weeks	5	weeks	JV	both	BDWT	WO	100		No	3.76	No	2.04E-01	5.43		King, 1975
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	783	days	10.3	months	GE	female	BDWT	WO	250		Yes	152	Yes	3.35E+00	5.51		Cromwell et al 1993
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/380/560/934	mg/org/d	FD	4	weeks	8-10	weeks	JV	both	BDWT	WO	560	934	No	100	Yes	2.36E+00	5.6	9.34	Allcroft et al., 1961
Copper (II) sulfate pentahydrate	100	Rat (*Rattus norvegicus*)	0/75	mg/kg diet	FD	80	days	44	days	JV	male	BDWT	WO	75		Yes	0.47	No	3.69E-02	5.89		Gershbein et al 1983
Copper (II) sulfate pentahydrate	100	Rabbit (*Oryctolagus cuniculus*)	0/122.2/223.67	mg/kg diet	FD	8	weeks	8	weeks	JV	both	BDWT	WO	223.67		Yes	1.787	Yes	5.33E-02	6.67		Anugwa et al., 1984
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/115/156/242	mg/kg diet	FD	5	weeks	31	days	JV	both	BDWT	WO	242		Yes	20.4	Yes	5.82E-01	6.90		Apgar et al., 1995
Copper chloride	100	Pig (*Sus scrofa*)	0/100/150/200	mg/kg diet	FD	28	days	26-32	days	JV	both	BDWT	WO	200		Yes	25.5	Yes	9.17E-01	7.19		Cromwell et al., 1998
Copper sulfate pentahydrate	100	Rabbit (*Oryctolagus cuniculus*)	0/100/150/200	mg/kg diet	FD	8	weeks	6	weeks	JV	both	BDWT	WO	200		Yes	1.724	Yes	6.33E-02	7.34		Omole, 1977
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/200	mg/kg diet	FD	28	days	26-32	days	JV	both	BDWT	WO	200		Yes	25.5	Yes	9.39E-01	7.36		Cromwell et al., 1998

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Copper chloride - tribasic	100	Pig (*Sus scrofa*)	0/116/218	mg/kg diet	FD	28	days	29	days	JV	both	BDWT	WO	218		Yes	17.7	Yes	5.98E-01	7.37		Cromwell et al., 1998
Copper sulfate	100	Pig (*Sus scrofa*)	0/151/197/246	mg/kg diet	FD	88	days	69	days	JV	NR	BDWT	WO	246		Yes	87.232	No	2.71E+00	7.63		Kline et al., 1971
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	12	weeks	NR	NR	JV	female	BDWT	WO	250		Yes	93.2	No	2.86E+00	7.66		Gipp et al., 1973
Copper oxide	100	Pig (*Sus scrofa*)	0/125/250	mg/kg diet	FD	28	days	28	days	JV	both	BDWT	WO	250		Yes	17.8	Yes	5.47E-01	7.68		Cromwell et al 1989
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	15	days	26	days	JV	male	BDWT	WO	250		Yes	10.1	Yes	3.12E-01	7.72		Luo and Dove, 1996
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	10	weeks	70	days	JV	both	BDWT	WO	250		Yes	64.7	Yes	2.03E+00	7.84		Myres and Bowland, 1973
Copper sulfate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	15	weeks	7	weeks	JV	NR	BDWT	WO	250		Yes	69.31	No	2.24E+00	8.08		Ritchie et al., 1963
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/231	mg/kg diet	FD	28	days	30	days	JV	both	BDWT	WO	231		Yes	20.8	Yes	7.39E-01	8.21		Cromwell et al., 1998
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/147/194/240	mg/kg diet	FD	112	days	9	weeks	JV	NR	BDWT	WO	240		Yes	87.5	No	2.71E+00	8.29		Braude and Ryder, 1973
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/345/579/843	mg/org/d	FD	19	weeks	8-10	weeks	JV	both	BDWT	WO	843		No	100	Yes	2.15E+00	8.43		Allcroft et al., 1961
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	59	days	64	days	JV	NR	BDWT	WO	250		Yes	54	No	1.82E+00	8.44		Prince et al 1979
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/117/226	mg/kg diet	FD	28	days	29	days	JV	both	BDWT	WO	226		Yes	17.7	Yes	6.66E-01	8.50		Cromwell et al., 1998
Copper chloride	100	Pig (*Sus scrofa*)	0/124/167/241	mg/kg diet	FD	28	days	30	days	JV	both	BDWT	WO	241		Yes	20.8	Yes	7.49E-01	8.68		Cromwell et al., 1998
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/125/250	mg/kg diet	FD	28	days	28	days	JV	both	BDWT	WO	250		Yes	15.6	Yes	5.99E-01	9.60		Cromwell et al 1989
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	35	days	3	weeks	JV	both	BDWT	WO	250		Yes	21.9	Yes	8.70E-01	9.93		Gipp, et al., 1974
Copper (II) sulfate	100	Mink (*Mustela vision*)	0/166/320	mg/kg diet	FD	4	month	90	days	JV	male	BDWT	WO	166	320	Yes	1.92	No	1.17E-01	10.2	19.6	Brandt, 1983
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250/650	mg/kg diet	FD	28	days	4	weeks	JV	NR	BDWT	WO	250	650	Yes	17.53	Yes	7.25E-01	10.3	26.9	Edmonds and Baker 1986
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	14	days	21	days	JV	both	BDWT	WO	250		Yes	7.384	No	3.55E-01	12.0		Radecki et al 1992
Copper sulfate pentahydrate	100	Mink (*Mustela vision*)	0/25/50/100/200	mg/kg diet	FD	20	weeks	NR	months	JV	both	BDWT	WO	200		Yes	1.753	No	1.09E-01	12.4		Aulerich et al 1982
Copper sulfate	100	Cattle (*Bos taurus*)	0/125/250/500	mg/kg diet	FD	98	days	6	weeks	JV	male	BDWT	WO	500		Yes	269	No	6.83E+00	12.7		Felsman et al., 1973
Cupric carbonate	100	Horse - Shetland pony (*Equus caballus*)	0/691.7/1209.1/2088.2	mg/org/d	FD	84	days	NR	NR	JV	NR	BDWT	WO	2088.2		Yes	151.8	Yes	2.64E+00	13.8		Smith et al., 1975
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250/425	mg/kg diet	FD	14	days	NR	NR	JV	female	BDWT	WO	250	425	Yes	22	Yes	1.43E+00	16.2	27.6	Suttle and Mills, 1966
Copper sulfate	100	Pig (*Sus scrofa*)	0/125/250/375/500	mg/kg diet	FD	33	days	28	days	JV	both	BDWT	WO	500		Yes	18	Yes	5.90E-01	16.4		Cromwell et al 1989
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/16.5	mg/kg bw/d	FD	14	days	NR	NR	JV	male	BDWT	WO	16.5		Yes	81.4	Yes	6.60E-02	16.5		Apgar and Kornegay, 1996
Copper oxide	100	Pig (*Sus scrofa*)	0/125/250/500	mg/kg diet	FD	28	days	28	days	JV	both	BDWT	WO	500		Yes	13.2	Yes	4.41E-01	16.7		Cromwell et al 1989
Copper (II) sulfate pentahydrate	25.45	Rat (*Rattus norvegicus*)	0/300/1000/3000/10000/30000	mg/L	DR	15	days	6	weeks	JV	both	BDWT	WO	1000	3000	Yes	0.174	Yes	1.18E-02	17.2	51.6	Hebert 1993
Copper (II) sulfate	39.81	Rat (*Rattus norvegicus*)	0/0.5	g/kg diet	FD	42	days	NR	NR	JV	male	BDWT	WO	0.5		Yes	0.2509	No	2.20E-02	17.5		Lalich,, et. al., 1965
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/125/250/500	mg/kg diet	FD	28	days	28	days	JV	both	BDWT	WO	500		Yes	12.2	Yes	4.34E-01	17.8		Cromwell et al 1989
Copper sulfate	100	Cattle (*Bos taurus*)	0/300/600/900	mg/kg diet	FD	98	days	6	weeks	JV	male	BDWT	WO	900		Yes	263	No	6.70E+00	22.9		Felsman et al., 1973
Anhydrous Copper sulfate	100	Rabbit (*Oryctolagus cuniculus*)	0/55.9/121.5/199.2/498.1/821.6	mg/kg diet	FD	28	days	28	days	JV	NR	BDWT	WO	498.1	821.6	Yes	1.6024	Yes	8.92E-02	27.7	45.7	Grobner et al., 1986
Copper sulfate pentahydrate	100	Rabbit (*Oryctolagus cuniculus*)	0/125/250/375	mg/kg diet	FD	70	days	7	weeks	JV	NR	BDWT	WO	375		Yes	0.5761	No	4.37E-02	28.4		Onifade and Abu 1998
Copper sulfate pentahydrate	100	Mink (*Mustela vision*)	0/308/568	mg/kg diet	FD	132	days	10	weeks	JV	both	BDWT	WO	568		Yes	2.403	No	1.41E-01	33.4		Bush et al., 1995
Copper (II) sulfate pentahydrate	25.45	Mouse (*Mus musculus*)	0/300/1000/3000/10000/30000	mg/L	DR	8	days	6	weeks	JV	both	BDWT	WO	1000	3000	No	0.0211	Yes	2.80E-03	33.8	101	Hebert 1993
copper sulfate pentahydrate	100	Rabbit (*Oryctolagus cuniculus*)	0/200	mg/kg diet	FD	6	weeks	5	weeks	JV	both	BDWT	WO	200		No	3.76	No	2.04E-01	37.1		King, 1975
Copper sulfate	100	Rat (*Rattus norvegicus*)	0/500	mg/kg diet	FD	50	days	21	days	JV	male	BDWT	WO	500		Yes	0.280	No	2.41E-02	43.1		White et al., 1985
Copper sulfate	100	Rat (*Rattus norvegicus*)	0/12	mg/org/d	DR	11	month	3	weeks	JV	female	BDWT	WO	12		Yes	0.262	Yes	2.50E-02	45.8		DeVries et al., 1986
Copper (II) sulfate pentahydrate	25.45	Rat (*Rattus norvegicus*)	0/500/1000/2000/4000/8000	mg/kg diet	FD	13	weeks	6	weeks	JV	both	BDWT	WO	4000	8000	Yes	0.338	Yes	1.65E-02	49.8	99.6	Hebert 1993
Copper chloride	100	Rat (*Rattus norvegicus*)	0/28/50/64	mg/kg bw/d	DR	1	weeks	4	weeks	JV	male	BDWT	WO	50	64	Yes	0.112	Yes	1.90E-04	50.0	64.0	Komulainen, 1983
Anhydrous Copper sulfate	100	Rabbit (*Oryctolagus cuniculus*)	0/50.9/99.1/176.9/504.5/901.5	mg/kg diet	FD	28	days	28	days	JV	NR	BDWT	WO	901.5		Yes	1.6276	Yes	1.07E-01	59.0		Grobner et al., 1986
Copper (I) acetate	51.84	Rat (*Rattus norvegicus*)	0/0.125	% in diet	DR	6	weeks	NR	months	JV	male	BDWT	WO	0.125		Yes	0.261	No	2.96E-02	73.4		Myers et al., 1993
Copper chloride	100	Rat (*Rattus norvegicus*)	0/800	mg/kg diet	FD	6	weeks	NR	NR	JV	female	BDWT	WO	800		Yes	0.165	No	1.56E-02	75.7		Tatum et al., 2000
Copper (II) sulfate pentahydrate	25.45	Rat (*Rattus norvegicus*)	0/1000/2000/4000/8000/16000	mg/kg diet	FD	15	days	6	weeks	JV	both	BDWT	WO	4000	8000	Yes	0.178	Yes	1.44E-02	82.5	165	Hebert 1993
Copper sulfate	100	Rat (*Rattus norvegicus*)	0/100/1000/2000	ug/g diet	FD	7	weeks	NR	NR	JV	female	BDWT	WO	1000	2000	Yes	0.198	No	1.81E-02	91.7	183	Keen et al., 1982
Copper (II) sulfate	39.81	Rat (*Rattus norvegicus*)	0/32/64/129/259/551	mg/org/d	FD	92	days	6	weeks	JV	male	BDWT	WO	129	259	Yes	0.352	No	2.91E-02	146	293	Hebert et al 1993
Copper (II) sulfate pentahydrate	25.45	Mouse (*Mus musculus*)	0/1000/2000/4000/8000/16000	mg/kg diet	FD	13	weeks	6	weeks	JV	both	BDWT	WO	4000	8000	Yes	0.029	Yes	5.10E-03	179	358	Hebert 1993
Copper chloride	100	Common shrew (*Sorex araneus*)	0/2.11	mg/org/d	FD	12	weeks	NR	NR	JV	both	BDWT	WO	2.11		Yes	0.0092	No	1.46E-03	229		Dodds-Smith et al., 1992
Copper (II) sulfate	39.81	Rat (*Rattus norvegicus*)	0/41/113/175/140	mg/org/d	DR	2	weeks	6	weeks	JV	male	BDWT	WO	113	175	Yes	0.174	No	2.05E-02	259	400	Hebert et al 1993
Copper chloride	100	Mouse (*Mus musculus*)	0/3.5/7	g/kg diet	FD	3	weeks	4	weeks	JV	both	BDWT	WO	3.5	7	Yes	0.0175	No	2.47E-03	494	988	Pettersen, et al., 2002
Copper (II) sulfate pentahydrate	25.45	Mouse (*Mus musculus*)	0/1000/2000/4000/8000/16000	mg/kg diet	FD	15	days	6	weeks	JV	both	BDWT	WO	16000		Yes	0.0236	Yes	4.00E-03	690		Hebert 1993
Copper (II) sulfate	39.81	Rat (*Rattus norvegicus*)	0/92/180/363/777/1275	mg/org/d	FD	15	days	6	weeks	JV	male	BDWT	WO	363	777	Yes	0.178	No	1.66E-02	812	1738	Hebert et al 1993
Copper (II) sulfate	39.81	Mouse (*Mus musculus*)	0/41/95/226/524	mg/org/d	DR	2	weeks	6	weeks	JV	male	BDWT	WO	95	226	Yes	0.0265	No	3.77E-03	1427	3395	Hebert et al 1993
Copper (II) sulfate	39.81	Mouse (*Mus musculus*)	0/173/382/736/1563/3201	mg/org/d	FD	92	days	6	weeks	JV	male	BDWT	WO	173	382	Yes	0.0326	No	4.12E-03	2113	4665	Hebert et al 1993
Copper (II) sulfate	39.81	Mouse (*Mus musculus*)	0/168/362/773/1154/2817	mg/org/d	FD	15	days	6	weeks	JV	female	BDWT	WO	1154	2817	Yes	0.0236	No	3.16E-03	19466	47519	Hebert et al 1993
Copper sulfate pentahydrate	100	Sheep (*Ovis aries*)	0/3	mg/kg bw/d	DR	35	days	6	months	JV	male	BDWT	WO		3	Yes	33.1	Yes	5.00E-01		3.00	Ortolani et al., 2003
Cuprous chloride	64.18	Rat (*Rattus norvegicus*)	0/100	mg/L	DR	91	days	NR	NR	JV	female	BDWT	WO		100	Yes	0.278	No	3.13E-02		5.78	Freundt and Ibrahim, 1990
Copper sulfate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	98	days	NR	NR	JV	both	BDWT	WO		250	Yes	90.5	Yes	2.70E+00		7.46	DeGoey et al 1971
Copper sulfate	100	Pig (*Sus scrofa*)	0/500	mg/kg diet	FD	23	days	NR	NR	JV	NR	MUSC	MU		500	Yes	89	No	2.75E+00		15.5	DeGoey et al 1971
Copper sulfate	100	Rat (*Rattus norvegicus*)	0/5.1/5.05/8.2/9.8/11.8/7.6	mg/org/d	FD	4	weeks	28	days	JV	both	BDWT	WO		5.1	No	0.217	Yes	1.01E-02		23.5	Boyden, 1938
Copper acetate	51.84	Rat (*Rattus norvegicus*)	0/2600	mg/kg diet	FD	21	weeks	NR	NR	JV	male	BDWT	WO		2600	No	0.4702	No	3.69E-02		106	Llewellyn et al., 1985
Copper sulfate	100	Rat (*Rattus norvegicus*)	0/1500	mg/kg diet	FD	12	weeks	21	days	JV	both	BDWT	WO		1500	No	0.38	No	3.10E-02		122	Fuentealba et al., 2000
Copper	100	Rat (*Rattus norvegicus*)	0/3000/4000/5000/6000	mg/kg diet	FD	15	weeks	NR	NR	JV	male	BDWT	WO		3000	Yes	0.202	No	1.84E-02		274	Haywood 1985
Copper sulfate	100	Rat (*Rattus norvegicus*)	0/3000/4000/5000/6000	mg/kg diet	FD	6	weeks	NR	months	JV	male	BDWT	WO		3000	Yes	0.162	No	1.54E-02		285	Haywood and Loughran 1985
Survival																						
Copper sulfate pentahydrate	25.45	Rabbit (*Oryctolagus cuniculus*)	0/75/150/300/450	mg/kg diet	FD	7	weeks	35	days	JV	male	MORT	WO	450		Yes	2.218	Yes	8.23E-02	4.25		Bassuny, 1991
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	783	days	10.3	months	GE	female	MORT	WO	250		Yes	152	Yes	3.35E+00	5.51		Cromwell et al 1993
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/380/560/934	mg/org/d	FD	4	weeks	8-10	weeks	JV	both	MORT	WO	560	934	No	100	Yes	2.36E+00	5.6	9.34	Allcroft et al., 1961
Copper (II) sulfate	100	Mink (*Mustela vision*)	0/166/320	mg/kg diet	FD	4	month	90	days	JV	male	MORT	WO	166	320	Yes	1.92	No	1.17E-01	10.2	19.6	Brandt, 1983
Copper	100	Cattle (*Bos taurus*)	0/50/200/500/1000	mg/kg diet	FD	6	weeks	3	days	JV	male	MORT	WO	500	1000	No	67	No	2.18E+00	16.3	32.5	Jenkins, 1989
Copper sulfate	100	Rat (*Rattus norvegicus*)	0/5.1/5.05/8.2/9.8/11.8/7.6	mg/org/d	FD	1	weeks	28	days	JV	both	MORT	WO	5.05	7.6	No	0.217	Yes	5.90E-03	23.3	35.0	Boyden, 1938
Copper sulfate pentahydrate	100	Pig (*Sus scrofa*)	0/250/650	mg/kg diet	FD	28	days	4	weeks	JV	NR	MORT	WO	650		Yes	15.71	Yes	6.26E-01	25.9		Edmonds and Baker 1986
Copper (II) sulfate pentahydrate	25.45	Rat (*Rattus norvegicus*)	0/300/1000/3000/10000/30000	mg/L	DR	15	days	6	weeks	JV	both	MORT	WO	3000	10000	Yes	0.088	Yes	3.84E-03	33.3	111	Hebert 1993
Copper sulfate pentahydrate	100	Mink (*Mustela vision*)	0/308/568	mg/kg diet	FD	132	days	10	weeks	JV	both	MORT	WO	568		Yes	2.403	No	1.41E-01	33.4		Bush et al., 1995
Copper (II) sulfate pentahydrate	25.45	Mouse (*Mus musculus*)	0/300/1000/3000/10000/30000	mg/L	DR	15	days	6	weeks	JV	female	MORT	WO	1000	3000	Yes	0.0211	Yes	2.80E-03	33.8	101	Hebert 1993
Anhydrous Copper sulfate	100	Rabbit (*Oryctolagus cuniculus*)	0/55.9/121.5/199.2/498.1/821.6	mg/kg diet	FD	28	days	28	days	JV	NR	MORT	WO	821.6		Yes	1.2328	Yes	6.83E-02	45.5		Grobner et al., 1986

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Anhydrous Copper sulfate	100	Rabbit (*Oryctolagus cuniculus*)	0/50.9/99.1/176.9/504.5/901.5	mg/kg diet	FD	28	days	28	days	JV	NR	MORT	WO	901.5		Yes	1.6276	Yes	1.07E-01	59.0		Grobner et al., 1986
Copper sulfate	100	Rat (*Rattus norvegicus*)	0/100/1000/2000	ug/g diet	FD	7	weeks	NR	NR	JV	female	MORT	WO	1000	2000	Yes	0.198	No	1.81E-02	91.7	183	Keen et al., 1982
Copper (II) sulfate pentahydrate	25.45	Rat (*Rattus norvegicus*)	0/500/1000/2000/4000/8000	mg/kg diet	FD	13	weeks	6	weeks	JV	both	MORT	WO	8000		Yes	0.275	Yes	1.44E-02	107		Hebert 1993
Copper chloride	100	Common shrew (*Sorex araneus*)	0/2.11	mg/org/d	FD	12	weeks	NR	NR	JV	both	MORT	WO	2.11		Yes	0.0092	No	1.46E-03	229		Dodds-Smith et al., 1992
Copper (II) sulfate	39.81	Rat (*Rattus norvegicus*)	0/41/113/175/140	mg/org/d	DR	2	weeks	6	weeks	JV	male	MORT	WO	113	175	Yes	0.174	No	2.05E-02	259	400	Hebert et al 1993
Copper (II) sulfate pentahydrate	25.45	Rat (*Rattus norvegicus*)	0/1000/2000/4000/8000/16000	mg/kg diet	FD	15	days	6	weeks	JV	both	MORT	WO	16000		Yes	0.122	Yes	9.20E-03	307		Hebert 1993
Copper	100	Rat (*Rattus norvegicus*)	0/3000/4000/5000/6000	mg/kg diet	FD	2	weeks	NR	NR	JV	male	MORT	WO	5000	6000	Yes	0.202	No	1.84E-02	457	548	Haywood 1985
Copper (II) sulfate pentahydrate	25.45	Mouse (*Mus musculus*)	0/1000/2000/4000/8000/16000	mg/kg diet	FD	15	days	6	weeks	JV	both	MORT	WO	16000		Yes	0.0236	Yes	4.00E-03	690		Hebert 1993
Copper (II) sulfate pentahydrate	25.45	Mouse (*Mus musculus*)	0/1000/2000/4000/8000/16000	mg/kg diet	FD	13	weeks	6	weeks	JV	both	MORT	WO	16000		Yes	0.0268	Yes	5.00E-03	760		Hebert,1993
Copper (II) sulfate	39.81	Rat (*Rattus norvegicus*)	0/32/64/129/259/551	mg/org/d	FD	92	days	6	weeks	JV	both	MORT	WO	551		Yes	0.275	No	2.38E-02	798		Hebert et al., 1993
Copper (II) sulfate	39.81	Mouse (*Mus musculus*)	0/41/95/226/524	mg/org/d	DR	2	weeks	6	weeks	JV	both	MORT	WO	95	226	Yes	0.0265	No	3.77E-03	1427	3395	Hebert et al., 1993
Copper (II) sulfate	39.81	Rat (*Rattus norvegicus*)	0/92/180/363/777/1275	mg/org/d	FD	15	days	6	weeks	JV	male	MORT	WO	1275		Yes	0.122	No	1.22E-02	4160		Hebert et al., 1993
Copper (II) sulfate	39.81	Mouse (*Mus musculus*)	0/168/362/773/1154/2817	mg/org/d	FD	15	days	6	weeks	JV	both	MORT	WO	2817		Yes	0.0236	No	3.16E-03	47519		Hebert et al., 1993
Copper (II) sulfate	39.81	Mouse (*Mus musculus*)	0/173/382/736/1563/3201	mg/org/d	FD	92	days	6	weeks	JV	both	MORT	WO	3201		Yes	0.0264	No	3.46E-03	48270		Hebert et al., 1993
Copper sulfate pentahydrate	25.45	Sheep (*Ovis aries*)	0/20	mg/kg bw/d	DR	10	weeks	6	months	JV	female	MORT	WO		20	No	59.1	No	3.89E+00		5.09	Gopinath et al., 1974
Copper sulfate pentahydrate	25.45	Sheep (*Ovis aries*)	0/0.714	g/org/d	OR	31	days	6	months	JV	female	MORT	WO		0.714	No	24	No	9.36E-01		7.57	Ishmael et al., 1971
Copper sulfate	100	Pig (*Sus scrofa*)	0/250	mg/kg diet	FD	15	weeks	7	weeks	JV	NR	MORT	WO		250	Yes	69.31	No	2.24E+00		8.08	Ritchie et al., 1963
Copper sulfate	100	Pig (*Sus scrofa*)	0/500	mg/kg diet	FD	23	days	NR	NR	JV	NR	MORT	WO		500	Yes	89	No	2.75E+00		15.5	DeGoey et al., 1971
Copper (I) acetate	51.84	Rat (*Rattus norvegicus*)	0/0.2	% in diet	DR	3	weeks	4-11	months	JV	male	MORT	WO		0.200	Yes	0.356	No	3.91E-02		114	McNatt et al., 1971
Lead																						
Reproduction																						
Lead acetate	100	Rat (*Rattus norvegicus*)	0/0.07/0.71/7/38	mg/kg bw/d	DR	62	days	21	days	GE	female	PRWT	WO	0.710	7.00	Yes	0.325	No	3.60E-02	0.710	7.00	Grant et al., 1980
Lead acetate	100	Rat (*Rattus norvegicus*)	0/10/50/100/200/500	mg/L	DR	21	days	NR	NR	GE	female	PRWT	WO	10.0	50.0	Yes	0.370	Yes	3.70E-02	1.00	5.00	Dilts and Ahokas, 1979
Lead acetate	100	Rat (*Rattus norvegicus*)	0/25/250	mg/L	DR	35	days	NR	NR	AD	male	RSUC	WO	25.0	250	No	0.6	No	6.25E-02	2.60	26.0	Gandley et al., 1999
Lead acetate	100	Rat (*Rattus norvegicus*)	0/0.64/3/6	mg/kg bw/d	DR	62	days	21	days	GE	both	PRWT	WO	3.00	6.00	Yes	0.29	No	3.25E-02	3.00	6.00	Grant et al., 1980
Lead	100	Sheep (*Ovis aries*)	0/2.3/4.5	mg/kg bw/d	FD	27	weeks	NR	NR	GE	female	RSUC	WO	4.50		No	na	Yes	2.27E-01	4.50		Carson et al., 1973
Lead acetate	100	Rat (*Rattus norvegicus*)	0/10/50/100/200/500	mg/L	DR	21	days	NR	NR	GE	female	PRWT	WO	50.0	100	Yes	0.3	Yes	3.00E-02	5.00	10.0	Dilts and Ahokas, 1980
Lead acetate	100	Guinea pig (*Cavia porcellus*)	0/5.5/11.0	mg/kg bw/d	DR	40	days	NR	NR	GE	female	PRWT	WO	5.50		No	1.0	No		5.50		Sierra and Tiffany-Castiglioni, 1992
Lead acetate	100	Rat (*Rattus norvegicus*)	0/10/50/100/1000	mg/kg diet	FD	92	weeks	21	days	JV	male	TEWT	TE	100	1000	Yes	0.615	No	4.61E-02	7.50	74.9	Jessup and Shott, 1969
Lead acetate	100	Rat (*Rattus norvegicus*)	0/0.92/4.7/8.9	mg/kg bw/d	DR	28.3	days	21	days	LC	female	Other	WO	8.90		Yes	0.3	No	3.35E-02	8.90		Kimmel et al., 1980
Lead acetate	100	Rat (*Rattus norvegicus*)	0/0.09/0.92/9.1/45	mg/kg bw/d	DR	28.3	days	21	days	GE	female	Other	WO	9.10	45.0	Yes	0.325	No	3.60E-02	9.10	45.0	Kimmel et al., 1980
Lead acetate	100	Cotton rat (*Sigmodon hispidus*)	0/2.1/28.8	mg/org	DR	7	weeks	NR	NR	AD	male	RHIS	RT	2.10	28.8	Yes	0.1698	No	na	12.4	170	McMurry et al., 1995
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/200/400	mg/kg	DR	100	days	21	days	GE	female	PRWT	WO	400		No	0.204	No	2.37E-02	25.4		Zenick et al., 1979
Lead acetate	100	Rat (*Rattus norvegicus*)	0/250	mg/kg diet	FD	35	days	70	days	LC	female	PRWT	WO	250		Yes	0.363	Yes	4.00E-02	27.5		Cerklewski, 1980
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/0.25/0.5/1.0	g/L	DR	60	days	NR	NR	SM	male	TEWT	TE	0.500	1.00	Yes	0.21143	No	2.45E-02	31.6	63.2	Chowdhury et al., 1984
Lead chloride	100	Rat (*Rattus norvegicus*)	0/0.8/4.0/32.5	mg/kg bw/d	DR	56	days	70	days	LC	female	PROG	WO	32.5		No	0.2024	No	2.35E-02	32.5		Bull, et.. al., 1978
Lead acetate	100	Rat (*Rattus norvegicus*)	0/300/1000	mg/L	DR	31	days	NR	days	LC	female	PRWT	WO	300	1000	No	0.32	No	3.55E-02	33.3	111	Winder et al., 1984
Lead acetate trihydrate	100	Rat (*Rattus norvegicus*)	0/23.03/47.26/81.96/206.52	mg/kg bw/d	DR	1	weeks	94	days	JV	male	SPCL	SM	47.3	82.0	Yes	0.404	Yes	4.40E-02	47.3	82.0	Wolfe et al., 1996
Lead acetate trihydrate	54.61	Rat (*Rattus norvegicus*)	0/45/900/4580	mg/L	DR	30	days	NR	NR	SM	male	Other	SV	900	4580	Yes	0.246	No	2.80E-02	56.0	285	Sourgens et al., 1987
Lead acetate	100	Hamster (*Mesocricetus auratus*)	0/547	mg/L	DR	51	days	15	weeks	GE	female	PROG	WO	547		Yes	0.167	No	1.98E-02	64.8		Carpenter, 1982
Lead acetate	100	Hamster (*Mesocricetus auratus*)	0/547	mg/L	DR	14	days	11	weeks	GE	female	PROG	WO	547		Yes	0.163	No	1.93E-02	64.9		Carpenter, 1982
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/0.05/0.15/0.45	% in water	DR	37	days	NR	NR	GE	female	PRWT	WO	0.150	0.450	No	0.35	No	3.85E-02	90.1	270	Ronis et al., 1998
Lead acetate	100	Rat (*Rattus norvegicus*)	0/250/1000	mg/L	DR	68	days	25	days	GE	female	PRWT	WO	1000		Yes	0.224	No	2.58E-02	115		Hamilton and O'Flaherty, 1994
Lead acetate	100	Rat (*Rattus norvegicus*)	0/250/500/1000	mg/L	DR	77	days	25	days	GE	female	PRWT	WO	1000		No	0.202	No	2.35E-02	116		Hamilton et al., 1994
Lead acetate	100	Rat (*Rattus norvegicus*)	0/1092	mg/L	DR	21	days	NR	NR	LC	female	PRWT	WO	1092		No	0.344	No	3.79E-02	120		Fox et al., 1977
Lead acetate	100	Mouse (*Mus musculus*)	0/0.1/1.0	% in diet	FD	8	weeks	2	months	GE	male	SPCV	TE	0.100	1.00	Yes	0.0158	No	2.27E-03	144	1440	Eyden et al., 1978
Lead carbonate	100	Mouse (*Mus musculus*)	0/0.08/0.16/0.4/0.5/1.0/2.0	% in diet	FD	30	days	NR	NR	LC	female	PRWT	WO	0.160	0.4	No	0.0325	No	4.11E-03	202	506	Maker et al., 1973
Lead carbonate	100	Mouse (*Mus musculus*)	0/0.08/0.16/0.4/0.5/1.0/2.0	% in diet	FD	30	days	NR	NR	LC	female	PRWT	WO	0.160	0.4	No	0.0325	No	4.11E-03	202	506	Maker et al., 1973
Lead acetate	100	Rat (*Rattus norvegicus*)	0/2.5/5.0/10	mg/g	DR	21	days	NR	NR	GE	female	DEYO	WO	2.5	5.0	No	0.338	No	3.73E-02	276	552	Cramer et al., 1980
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/0.05/0.1/0.5/1	% in water	DR	10	weeks	NR	NR	AD	male	TEWT	MT	0.500	1.00	Yes	0.439	No	4.72E-02	294	587	Nathan et al., 1992
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/10000	mg/L	DR	9	month	NR	NR	SM	male	RHIS	TE	10000		No	0.35	No	3.85E-02	600		Wenda-Rozewicka et al., 1996
Lead	100	Rat (*Rattus norvegicus*)	0/0.2/0.4/1.0	% in diet	FD	4	days	NR	NR	LC	female	PRWT	WO	0.400	1.00	Yes	0.311	Yes	4.68E-02	601	1500	Barrett and Livesey, 1983
Lead acetate	100	Rat (*Rattus norvegicus*)	0/216/420/639.36	mg/kg bw/d	DR	13	weeks	NR	NR	JV	male	FERT	WO	639		No	0.25	Yes	4.00E-02	639		Piasekand Kostial, 1987
Lead acetate	100	Rat (*Rattus norvegicus*)	0/1269/9307.8	ug/org/d	FD	339	days	26-27	days	JV	both	PRWT	WO		1269	Yes	0.509	No	3.94E-02		2.49	Morris et al., 1938
Lead	100	Rat (*Rattus norvegicus*)	0/25	ppm in mg/L	DR	9	month	21	days	JV	female	DEYO	WO		25.0	No	0.179	No	2.11E-02		2.94	Schroeder and Mitchener, 1971
Lead	100	Mouse (*Mus musculus*)	0/25	mg/L	DR	6	month	21	days	JV	female	DEYO	WO		25.0	No	0.0225	No	3.26E-03		3.62	Schroeder and Mitchener, 1971
Lead acetate	100	Rat (*Rattus norvegicus*)	0/1.920	mg/org/d	DR	120	days	1	days	GE	male	SPCL	TE		1.92	Yes	0.284	No	3.19E-02		6.76	Saxena et. al. 1989
Lead dinitrate	100	Mouse (*Mus musculus*)	0/21.75	mg/org	DR	5	weeks	NR	NR	AD	male	TEDG	TE		0.614	No	0.0375	No	5.16E-03		16.6	Cernochova and Kamarad, 1992
Lead acetate	100	Rat (*Rattus norvegicus*)	0/49.6	mg/kg bw/d	FD	102	days	NR	NR	GE	female	PROG	WO		49.6	Yes	0.35	No	2.90E-02		49.6	Winneke et al., 1977
Lead acetate	100	Rat (*Rattus norvegicus*)	0/500	mg/L	DR	18	days	NR	NR	GE	female	PRWT	WO		500	No	0.32	No	3.55E-02		55.5	Hayashi, 1983
Lead acetate	100	Rat (*Rattus norvegicus*)	0/0.5/1.0	g/L	DR	90	days	NR	NR	AD	male	SPCL	SM		0.500	Yes	0.12	No	1.47E-02		61.2	Kempinas et. al 1988
Lead acetate	54.61	Mouse (*Mus musculus*)	0/0.13	% in water	DR	23	days	NR	NR	GE	female	PRWT	WO		0.130	Yes	0.325	No	3.60E-02		78.6	Donald et al., 1981
Lead acetate	54.61	Mouse (*Mus musculus*)	0/0.13	% in water	DR	62	days	NR	NR	GE	female	PRWT	WO		0.130	Yes	0.03	No	4.22E-03		99.8	Donald et al., 1986
Lead acetate	100	Mouse (*Mus musculus*)	0/1000	mg/L	DR	18	weeks	6-8	weeks	LC	female	PRWT	WO		1000	Yes	0.03755	No	5.16E-03		137	Talcott and Koller, 1983
Lead chloride	100	Mouse (*Mus musculus*)	0/1	g/L	DR	12	weeks	9	weeks	SM	male	PRFM	WO		1.00	Yes	0.0334	No	4.65E-03		139	Johansson and Wide, 1986
Lead	100	Mouse (*Mus musculus*)	0/0.125/0.25/0.5	% in diet	FD	18	days	NR	NR	GE	female	PRWT	WO		0.125	No	0.0375	No	4.62E-03		154	Jacquet et al., 1997
Lead acetate trihydrate	100	Rat (*Rattus norvegicus*)	0/171.27	mg/kg bw/d	DR	4	weeks	99	days	JV	male	SPCL	SM		171	Yes	0.51751	Yes	2.28E-02		171	Wolfe et al., 1996
Lead acetate	100	Rat (*Rattus norvegicus*)	0/1500/3500/5500/7500	mg/L	DR	6	weeks	4	months	GE	female	RHIS	WO		1500	Yes	0.19	No	2.22E-02		175	Blanusa, et al., 1989
Lead acetate	100	Rat (*Rattus norvegicus*)	0/60	mg/org/d	DR	22	days	NR	NR	GE	female	PRWT	WO		60.0	No	0.338	No	3.73E-02		178	Cramer et al., 1980
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/0.1/0.3	% water	DR	30	days	52	days	JV	male	GREP	PY		0.100	Yes	0.37188	Yes	1.35E-01		198	Sokol et al., 1985
Lead acetate	100	Rat (*Rattus norvegicus*)	0/200	mg/kg bw	DR	13	weeks	NR	NR	GE	female	PRWT	WO		200	Yes	0.2	No	2.33E-02		200	Hallen et al., 1995
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/0.5	% in water	DR	21	days	80	days	JV	female	PRWT	WO		0.500	Yes	0.351	Yes	2.81E-02		218	Rabe et al., 1985
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/1/2	% in diet	FD	3	weeks	NR	NR	LC	female	PRWT	WO		0.500	No	0.4	No	3.24E-02		221	Mykkanen et al., 1980
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/0.5	% in diet	FD	1	weeks	19	weeks	LC	female	PRWT	WO		0.500	No	0.3846	No	3.13E-02		222	Hsu, 1980

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/0.5/1/2	% in diet	FD	3	weeks	NR	NR	LC	female	PRWT	WO		0.500	No	0.32	No	2.69E-02		230	Mykkanen et al., 1980
Lead carbonate	77.55	Rat (*Rattus norvegicus*)	0/0.4/4.0	% in diet	FD	25	days	NR	NR	LC	female	PRWT	WO		0.400	No	0.344	No	2.86E-02		258	Alfano and Petit, 1982
Lead acetate	100	Rat (*Rattus norvegicus*)	0/0.3	% in water	DR	21	days	NR	NR	LC	female	PRWT	WO		0.300	No	0.35	No	3.85E-02		330	Yu et al., 1996
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/6000	mg/L	DR	30	days	52	days	JV	male	SPCL	SM		6000	Yes	0.412	No	4.46E-02		354	Sokol, 1989
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/6000	mg/L	DR	17	days	NR	NR	GE	female	PRWT	WO		6000	No	0.35	No	3.85E-02		360	Ronis et al., 1998
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/6000	mg/L	DR	24	days	NR	NR	LC	female	PRWT	WO		6000	No	0.35	No	3.85E-02		360	Ronis et al., 1998
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/6000	mg/L	DR	12	days	NR	NR	GE	female	PRWT	WO		6000	Yes	0.338	No	3.73E-02		362	Ronis et al., 1996
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/6000	mg/L	DR	30	days	27	days	JV	male	SPCL	SM		6000	Yes	0.32	No	3.55E-02		364	Sokol, 1989
Lead acetate	54.61	Mouse (*Mus musculus*)	0/0.5	% in water	DR	44	days	NR	NR	GE	female	PRWT	WO		0.500	No	0.0325	No	4.53E-03		381	Pinon-Lataillade et al., 1995
Lead acetate	54.61	Mouse (*Mus musculus*)	0/0.5	% in water	DR	14	days	NR	NR	LC	female	PRWT	WO		0.500	No	0.0325	No	4.53E-03		381	Draski et al., 1989
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/6000	mg/L	DR	50	days	24	days	JV	female	RBEH	WO		6000	Yes	0.2	No	2.33E-02		381	Ronis et al., 1996
Lead acetate	54.61	Mouse (*Mus musculus*)	0/0.5	% in water	DR	45	days	50-100	days	GE	female	ODVP	WO		0.500	Yes	0.018	No	2.66E-03		404	Rasile et. al. 1995
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/7	g/L	DR	22	days	NR	NR	GE	female	PRWT	WO		7.00	No	0.35	No	3.85E-02		420	Thoreux-Manlay et al., 1995
Lead acetate	54.61	Mouse (*Mus musculus*)	0/0.25	% in water	DR	48	days	NR	NR	GE	female	PRWT	WO		0.250	Yes	0.035	Yes	1.12E-02		437	Donald et al., 1987
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/1	% in water	DR	9	month	3	months	SM	male	SPCL	TE		1.00	Yes	0.5	No	5.31E-02		579	Marchlewicz et al., 1993
Lead acetate trihydrate	54.61	Rat (*Rattus norvegicus*)	0/1	% in water	DR	9	month	NR	NR	SM	male	TEDG	TE		1.00	Yes	0.35	No	3.85E-02		600	Piasecka et. al. 1995
Lead acetate	100	Rat (*Rattus norvegicus*)	0/5500	mg/L	DR	3	weeks	14	weeks	LC	female	PRWT	WO		5500	Yes	0.2137	No	2.47E-02		635	Piasek et al., 1988
Lead acetate	100	Mouse (*Mus musculus*)	0/0.5	% in diet	FD	7	days	NR	NR	GE	female	RSUC	EM		0.500	No	0.02875	No	3.71E-03		646	Jacquet, 1977
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/1	% in water	DR	126	days	1	days	GE	female	PROG	WO		1.00	No	0.156	No	1.86E-02		651	Selvin-Testa et. al. 1997
Lead acetate	100	Rat (*Rattus norvegicus*)	0/750	mg/kg bw/d	DR	20	weeks	10	weeks	GE	female	PRWT	WO		750	Yes	0.2681	No	3.03E-02		750	Piasek and Kostial 1991
Lead acetate	54.61	Mouse (*Mus musculus*)	0/10	mg/ml	DR	4	days	NR	NR	LC	female	PRWT	WO		10.0	No	0.0325	No	4.53E-03		762	Epstein, et.al. 1991
Lead carbonate	77.55	Rat (*Rattus norvegicus*)	0/1	% in diet	FD	2	weeks	NR	NR	LC	female	PRWT	WO		1.00	No	0.35	No	2.90E-02		828	Holtzman et al., 1981
Lead carbonate	100	Rat (*Rattus norvegicus*)	0/1	% in diet	FD	7	days	NR	NR	LC	female	PRWT	WO		1.00	No	0.338	No	2.82E-02		833	Holtzman et al., 1978
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/2	% in diet	FD	21	days	NR	NR	LC	female	PRWT	WO		2.00	Yes	0.21	No	1.91E-02		991	Barlow et al., 1977
Lead acetate trihydrate	100	Mouse (*Mus musculus*)	0/4.98/10.055/20.52	mg/ml	DR	18	weeks	11	weeks	JV	female	PRWT	WO		4.84	Yes	0.0422	Yes	1.13E-02		1370	Gulati et al., 1985
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/4	% in diet	FD	30	days	NR	NR	LC	female	PRWT	WO		4.00	No	0.4	No	3.24E-02		1770	McConnell and Berry, 1979
Lead acetate	100	Mouse (*Mus musculus*)	0/61.6	mg/org	DR	14	weeks	NR	NR	GE	both	PROG	WO		61.6	Yes	0.031	Yes	7.00E-03		1990	Sharma and Kanwar, 1985
Lead carbonate	77.55	Rat (*Rattus norvegicus*)	0/4	% in diet	FD	16	days	NR	NR	LC	female	PROG	WO		4.00	No	0.35	No	2.90E-02		2570	Goldstein et al., 1974
Lead carbonate	77.55	Rat (*Rattus norvegicus*)	0/4	% in diet	FD	7	days	NR	NR	LC	female	PRWT	WO		4.00	No	0.35	No	2.90E-02		2570	Holtzman et al., 1980
Lead carbonate	77.55	Rat (*Rattus norvegicus*)	0/4	% in diet	FD	25	days	NR	NR	LC	female	PRWT	WO		4.00	No	0.35	No	2.90E-02		2570	Krigman et al., 1974
Lead carbonate	77.55	Rat (*Rattus norvegicus*)	0/4.0	% in diet	FD	27	days	NR	NR	LC	female	PROG	WO		4.5	No	0.248	No	2.18E-02		2840	Pentschew and Garro 1966
Lead acetate	100	Mouse (*Mus musculus*)	0/58	mg/org	DR	14	weeks	21	days	JV	both	PROG	WO		58.0	Yes	0.016	Yes	4.10E-04		3630	Sharma and Kanwar, 1985
Lead acetate	100	Rat (*Rattus norvegicus*)	0/5	% in diet	FD	17	days	NR	NR	LC	female	PRWT	WO		5.00	No	0.35	No	4.32E-02		6170	Michaelson and Sauerhoff, 1974
Growth																						
Lead carbonate	100	Horse (*Equus caballus*)	0/30	mg/kg diet	FD	15	weeks	20 to 21	weeks	JV	male	BDWT	WO	30.0		No	181.44	Yes	1.15E+00	0.150		Willoughby et al., 1972
Lead acetate	100	Rat (*Rattus norvegicus*)	0/0.5	ug/g bw/d	FD	21	days	0	days	JV	female	BDWT	WO	0.500		No	0.179	No	1.67E-02	0.500		Fox et.al., 1982
Lead acetate	100	Rat (*Rattus norvegicus*)	0/10/50/100/200/500	mg/L	DR	21	days	NR	NR	GE	female	BDWT	WO	10.0	50.0	Yes	0.370	Yes	3.70E-02	1.00	5.00	Dilts and Ahokas, 1979
Lead acetate	100	Rat (*Rattus norvegicus*)	0/0.13/1.27/13/69	mg/kg bw/d	DR	7	days	50	days	AD	female	BDWT	WO	1.27	13	Yes	0.325	No	3.60E-02	1.27	13.0	Kimmel et al., 1980
Lead carbonate	77.55	Cattle (*Bos taurus*)	0/0.64/1.28/2.57	mg/kg bw/d	OR	7	weeks	1	weeks	JV	male	BDWT	WO	2.57		Yes	61	No	2.02E+00	1.99		Lynch et al., 1975
Lead chloride	100	Rat (*Rattus norvegicus*)	0/20/200	mg/kg	DR	14	days	21	days	JV	female	BDWT	WO	20.0		Yes	0.1228	No	1.50E-02	2.40		Wiebe and Barr, 1988
Lead	100	Rat (*Rattus norvegicus*)	0/25	mg/L	DR	332	days	28	days	JV	both	BDWT	WO	25.0		Yes	0.1575	No	1.88E-02	2.98		Schroeder et al., 1963
Lead acetate	100	Rat (*Rattus norvegicus*)	0/0.92/4.7/8.9	mg/kg bw/d	DR	7	weeks	21	days	GE	female	BDWT	WO	4.70	8.90	Yes	0.3	No	3.35E-02	4.70	8.90	Kimmel et al., 1980
Lead acetate	100	Dog (*Canis familiaris*)	0/27/102	mg/kg diet	FD	7	month	NR	NR	JV	NR	BDWT	WO	102		Yes	9.3	No	4.30E-01	4.71		Horwitt and Cowgill, 1937
Lead acetate	100	Rat (*Rattus norvegicus*)	0/50/250	mg/L	DR	30	days	22-24	days	JV	male	BDWT	WO	50.0	250	Yes	0.27	No	3.05E-02	5.64	28.2	Zheng et al., 1996
Lead acetate	100	Rat (*Rattus norvegicus*)	0/50/250/500	mg/L	DR	23	days	22	days	JV	female	BDWT	WO	50.0	250	No	0.204	No	2.37E-02	5.80	29.0	Hammond et al., 1989
Lead carbonate	100	Cattle (*Bos taurus*)	0/4.16/7.79	mg/kg bw/d	OR	84	days	NR	NR	JV	male	BDWT	WO	7.79		Yes	80.2	Yes	1.57E-01	7.79		Lynch et al., 1976
Lead acetate	100	Rat (*Rattus norvegicus*)	0/9.1	mg/kg bw/d	OR	6	weeks	NR	NR	AD	male	BDWT	WO	9.10		Yes	0.475	No	3.73E-02	9.10		Rader et al., 1981
Lead acetate	100	Rat (*Rattus norvegicus*)	0/100/5000	mg/L	DR	6	month	NR	NR	AD	male	BDWT	WO	100	5000	Yes	0.483	No	5.14E-02	10.6	532	Gruber et al., 1997
Lead acetate	100	Rat (*Rattus norvegicus*)	0/100	mg/L	DR	140	days	21	days	JV	male	BDWT	WO	100		Yes	0.443	No	4.76E-02	10.7		El-Gazzar et al., 1978
Lead acetate	100	Rat (*Rattus norvegicus*)	0/15.1	mg/kg bw/d	DR	6	weeks	NR	NR	JV	male	BDWT	WO	15.1		Yes	0.337	No	3.72E-02	15.1		Rader et al., 1981
Lead acetate	100	Rat (*Rattus norvegicus*)	0/200	mg/kg diet	FD	10	weeks	NR	NR	JV	male	BDWT	WO	200		No	0.523	No	4.03E-02	15.4		Mahaffey et al., 1977
Lead acetate	100	Rat (*Rattus norvegicus*)	0/15.54	mg/kg bw/d	OR	6	weeks	NR	NR	AD	male	BDWT	WO	15.5		Yes	0.475	No	3.73E-02	15.5		Rader et al., 1981
Lead acetate	100	Rat (*Rattus norvegicus*)	0/16.1	mg/kg bw/d	DR	7	weeks	NR	NR	JV	male	BDWT	WO	16.1		Yes	0.341	No	3.76E-02	16.1		Rader et. al. 1981
Lead acetate	100	Mouse (*Mus musculus*)	0/0.1/1.0	mg/ml	DR	14	days	0	days	JV	NR	BDWT	WO	0.100	1.00	Yes	0.00692	No	1.10E-03	16.3	163	Gerber et al., 1978
Lead acetate	100	Rat (*Rattus norvegicus*)	0/1269/9307.8	ug/org/d	FD	339	days	26-27	days	JV	both	BDWT	WO	9308		Yes	0.509	No	3.94E-02	18.3		Morris et al., 1938
Lead acetate	100	Rat (*Rattus norvegicus*)	0/0.19/0.70/2.8/5.9/12.9/24.3	mg/kg bw/d	DR	10	weeks	NR	NR	JV	male	BDWT	WO	24.3		Yes	0.31	No	3.45E-02	24.3		Mahaffey et al., 1973
Lead chloride	100	Rat (*Rattus norvegicus*)	0/0.8/4.0/32.5	mg/kg bw/d	DR	56	days	70	days	LC	female	BDWT	WO	32.5		No	0.2024	No	2.35E-02	32.5		Bull, et.. al., 1978
Lead acetate	100	Sheep (*Ovis aries*)	0/10/100/500/1000	mg/kg diet	FD	84	days	NR	NR	JV	male	BDWT	WO	1000		Yes	37	Yes	1.21E+00	32.7		Fick et al., 1976
Lead acetate	100	Rat (*Rattus norvegicus*)	0/350	mg/L	DR	10	weeks	NR	NR	JV	male	BDWT	WO	350		Yes	0.352	No	3.87E-02	38.5		Bankowska and Hine, 1985
Lead sulfate	100	Cattle (*Bos taurus*)	0/16/43/305	mg/kg bw/d	FD	7	weeks	16	weeks	JV	male	BDWT	WO	43.0		Yes	137.43	Yes	3.64E+00	43.0		Logner et al., 1984
Lead acetate trihydrate	100	Rat (*Rattus norvegicus*)	0/18.9/38.21/71.5/178.4	mg/kg bw/d	DR	4	weeks	94	days	JV	male	BDWT	WO	71.5	178	Yes	0.48933	Yes	2.79E-02	71.5	178	Wolfe et al., 1996
Lead acetate	100	Rat (*Rattus norvegicus*)	0/100	mg/kg bw/d	FD	4	weeks	NR	NR	JV	male	BDWT	WO	100		Yes	0.11	No	1.12E-02	100		Rudra Pal et al., 1975
Lead acetate	100	Rat (*Rattus norvegicus*)	0/2.3/7.0/12/21/67/220	mg/org/d	DR	10	weeks	NR	NR	JV	male	BDWT	WO	21.0	67.0	Yes	0.175	No	2.06E-02	120	383	Goyer et al., 1970
Lead acetate	100	Mouse (*Mus musculus*)	0/0.1/1.0	% in diet	FD	4	weeks	3	months	JV	both	BDWT	WO	0.100	1.00	Yes	0.0220	No	2.98E-03	136	1360	Eyden et al., 1978
Lead acetate	100	Mouse (*Mus musculus*)	0/1000	mg/L	DR	18	weeks	6-8	weeks	LC	female	BDWT	WO	1000		Yes	0.03755	No	5.16E-03	137		Talcott and Koller, 1983
Lead chloride	100	Mouse (*Mus musculus*)	0/1	g/L	DR	12	weeks	NR	NR	GE	male	BDWT	WO	1.00		Yes	0.0334	No	4.65E-03	139		Johansson and Wide, 1986
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/0.1/0.3	% water	DR	30	days	52	days	JV	male	BDWT	WO	0.100	0.300	Yes	0.33188	Yes	1.03E-01	169	508	Sokol et al., 1985
Lead acetate trihydrate	100	Rat (*Rattus norvegicus*)	0/171.27	mg/kg bw/d	DR	4	weeks	99	days	JV	male	BDWT	WO	171		Yes	0.51751	Yes	2.28E-02	171		Wolfe et al., 1996
Lead acetate	54.61	Mouse (*Mus musculus*)	0/0.25/0.5	% in water	DR	6	weeks	7	weeks	SM	male	BDWT	WO	0.250	0.500	Yes	0.0398	No	5.44E-03	187	373	Wadi and Ahmad, 1999
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/0.5	% in water	DR	21	days	80	days	JV	female	BDWT	WO	0.500		Yes	0.351	Yes	2.81E-02	218		Rabe et al., 1985
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/0.5/1/2	% in diet	FD	1	weeks	NR	NR	LC	female	BDWT	WO	0.500	1.00	No	0.32	No	2.69E-02	230	460	Mykkanen et al., 1980
Lead acetate trihydrate	54.61	Rat (*Rattus norvegicus*)	0/45/900/4580	mg/L	DR	30	days	NR	NR	JV	male	BDWT	WO	4580		Yes	0.246	No	2.80E-02	285		Sourgens et al., 1987
Lead acetate	100	Mouse (*Mus musculus*)	0/13/130/1300/2600	mg/L	DR	10	weeks	NR	NR	JV	male	BDWT	WO	2600		Yes	0.0334	No	4.65E-03	362		Exon et al., 1979
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/6000	mg/L	DR	30	days	52	days	JV	male	BDWT	WO	6000		Yes	0.32	No	3.55E-02	364		Sokol, 1989

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Lead acetate	100	Rat (*Rattus norvegicus*)	0/0.5	% in diet	FD	14	month	0	days	JV	NR	BDWT	WO	0.500		Yes	0.278	No	2.40E-02	431		Gerber et al., 1978
Lead carbonate	100	Mouse (*Mus musculus*)	0/0.08/0.16/0.4/0.5/1.0/2.0	% in diet	FD	30	days	NR	NR	LC	female	BDWT	WO	0.500	1.00	No	0.0325	No	4.11E-03	632	1260	Maker et al., 1973
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/1	% in water	DR	126	days	1	days	GE	female	BDWT	WO	1.00		No	0.156	No	1.86E-02	651		Selvin-Testa et. al. 1997
Lead acetate	100	Rat (*Rattus norvegicus*)	0/750	mg/kg bw/d	DR	20	weeks	10	weeks	GE	female	BDWT	WO	750		Yes	0.2681	No	3.03E-02	750		Piasek and Kostial 1991
Lead carbonate	100	Mouse (*Mus musculus*)	0/0.08/0.16/0.4/0.5/1.0/2.0	% in diet	FD	28	days	NR	NR	LC	female	BDWT	WO	1.00	2.00	No	0.0325	No	4.11E-03	1260	2530	Maker et al., 1973
Lead	100	Rat (*Rattus norvegicus*)	0/0.2/0.4/1.0	% in diet	FD	18	days	NR	NR	LC	female	BDWT	WO	1.00		Yes	0.296	Yes	5.40E-02	1500		Barrett and Livesey, 1983
Lead nitrate	100	Rat (*Rattus norvegicus*)	0/25	mg/L	DR	9	days	21	days	JV	male	BDWT	WO		25.0	Yes	0.0557	No	7.36E-03		3.3	Schroeder et al., 1970
Lead acetate	100	Cattle (Bos taurus)	0.015	g/kg bw/d	FD	283	days	7	months	JV	male	BDWT	WO		0.0150	Yes	260	No	6.64E+00		15.0	Kelliher, et al. 1973
Lead acetate	100	Rat (*Rattus norvegicus*)	0/250/1000	mg/L	DR	92	days	25	days	GE	female	GMPH	TB		250	Yes	0.224	No	2.58E-02		28.7	Hamilton and O'Flaherty, 1994
Lead acetate	100	Rat (*Rattus norvegicus*)	0/250	mg/L	DR	5	days	26	days	JV	female	BDWT	WO		250	No	0.204	No	2.37E-02		29.0	Hammond and Succop, 1995
Lead acetate	100	Rat (*Rattus norvegicus*)	0/250/500/1000	mg/L	DR	7	days	25	days	GE	female	BDWT	WO		250	No	0.202	No	2.35E-02		29.0	Hamilton et al., 1994
Lead acetate	100	Rat (*Rattus norvegicus*)	0/250	mg/L	DR	26	days	22	days	JV	female	BDWT	WO		250	Yes	0.175	No	2.06E-02		29.5	Hammond et al., 1993
Lead acetate	100	Rat (*Rattus norvegicus*)	0/250	mg/L	DR	14	days	26	days	JV	female	Other	TA		250	No	0.15	No	1.80E-02		29.9	Hammond et al., 1993
Lead acetate	100	Rat (*Rattus norvegicus*)	0/250	mg/L	DR	10	days	26	days	JV	female	BDWT	WO		250	Yes	0.13	No	1.58E-02		30.4	Minnema and Hammond, 1994
Lead carbonate	100	Dog (*Canis familiaris*)	0/50	mg/kg bw	OR	5	weeks	<1	year	JV	NR	BDWT	WO		50	No	10.45	No	4.73E-01		50.0	White, 1977
Lead	100	Shrew (*Sorex araneus*)	0/371/423/1052	mg/kg diet	FD	31	days	NR	NR	JV	both	BDWT	WO		371	Yes	0.0071	No	1.18E-03		61.5	Pankakoski et al., 1994
Lead acetate	100	Pig (*Sus scrofa*)	0/1000	mg/L	FD	13	weeks	4	weeks	JV	NR	BDWT	WO		1000	Yes	7.5	Yes	1.30E+00		173	Hsu et al., 1975
Lead acetate	100	Rat (*Rattus norvegicus*)	0/68	mg/org/d	FD	5	weeks	NR	NR	MA	NR	BDWT	WO		68	Yes	0.25	No	2.20E-02		272	Lessler and Wright, 1976
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/6000	mg/L	DR	30	days	27	days	JV	male	BDWT	WO		6000	Yes	0.412	No	4.46E-02		354	Sokol, 1989
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/6000	mg/L	DR	50	days	24	days	JV	male	BDWT	WO		6000	Yes	0.26	No	2.95E-02		371	Ronis et al., 1996
Lead acetate	54.61	Mouse (*Mus musculus*)	0/0.5	% in water	DR	45	days	50-100	days	GE	female	BDWT	WO		0.500	Yes	0.018	No	2.66E-03		404	Rasile et. al. 1995
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/1/2	% in diet	FD	1	weeks	NR	NR	LC	female	BDWT	WO		1.00	No	0.4	No	3.24E-02		442	Mykkanen et al., 1980
Lead acetate	100	Rat (*Rattus norvegicus*)	0/5500	mg/L	DR	6	weeks	14	weeks	LC	female	BDWT	WO		5500	Yes	0.2045	No	2.37E-02		638	Piasek et al., 1988
Lead acetate trihydrate	100	Mouse (*Mus musculus*)	0/4.98/10.055/20.52	mg/ml	DR	10	weeks	11	weeks	JV	female	BDWT	WO		5.08	Yes	0.04	Yes	5.60E-03		748	Gulati et al., 1985
Lead acetate	54.61	Rat (*Rattus norvegicus*)	0/2	% in diet	FD	21	days	NR	NR	LC	female	BDWT	WO		2.00	Yes	0.21	No	1.91E-02		991	Barlow et al., 1977
Lead acetate	100	Rat (*Rattus norvegicus*)	0/1.0	% in diet	FD	2	weeks	0	days	JV	NR	BDWT	WO		1.00	Yes	0.0165	No	2.40E-03		1430	Gerber et al., 1978
Lead carbonate	77.55	Rat (*Rattus norvegicus*)	0/4	% in diet	FD	2	weeks	60-80	days	JV	male	BDWT	WO		4.00	No	0.523	No	4.03E-02		2390	Holtzman et al., 1981
Lead carbonate	77.55	Rat (*Rattus norvegicus*)	0/4	% in diet	FD	14	days	60	days	JV	male	BDWT	WO		4.00	Yes	0.2929	No	2.50E-02		2650	Holtzman et al., 1980

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Survival																						
Lead acetate	100	Mouse (*Mus musculus*)	0/25	mg/L	DR	669	days	19-20	days	JV	both	LFSP	WO	25.0		Yes	0.031	No	4.34E-03	3.50		Schroeder and Mitchener, 1975
Lead carbonate	100	Cattle (*Bos taurus*)	0/4.16/7.79	mg/kg bw/d	OR	84	days	NR	NR	JV	male	SURV	WO	7.79		Yes	80.2	Yes	1.57E-01	7.79		Lynch et al., 1976
Lead acetate	100	Rat (*Rattus norvegicus*)	0/18/62/141/548	mg/kg diet	FD	2	year	NR	NR	NR	male	MORT	WO	141	548	No	0.51	No	3.95E-02	10.9	42.4	Azar et al., 1973
Lead sulfate	100	Cattle (*Bos taurus*)	0/16/43/305	mg/kg bw/d	FD	10	days	74	days	JV	male	MORT	WO	16.0	43.0	Yes	92.49	Yes	3.64E+00	16.0	43.0	Logner et al., 1984
Lead acetate	100	Dog (*Canis familiaris*)	0/16/57/155/576	mg/kg diet	FD	2	year	NR	NR	NR	both	MORT	WO	576		No	14	No	6.01E-01	24.7		Azar et al., 1973
Lead acetate	100	Rabbit (*Oryctolagus cuniculus*)	0/54.6/546	mg/kg diet	FD	10	days	NR	NR	GE	female	MORT	WO	546		No	4.1	No	2.19E-01	29.2		Jessup, 1967
Lead acetate	100	Pig (*Sus scrofa*)	0/3.77/7.54/15.09/30.17	mg/kg bw/d	DR	13	weeks	6	weeks	JV	NR	MORT	WO	30.2		Yes	24	No	1.73E+00	30.2		Lassen and Buck, 1979
Lead acetate	100	Rat (*Rattus norvegicus*)	0/350	mg/L	DR	4	weeks	NR	NR	JV	male	MORT	WO	350		Yes	0.22	No	2.53E-02	40.3		Bankowska and Hine, 1985
Lead acetate	100	Hamster (*Mesocricetus auratus*)	0/547	mg/L	DR	51	days	15	weeks	GE	female	MORT	WO	547		Yes	0.167	No	1.98E-02	64.8		Carpenter, 1982
Lead acetate	100	Hamster (*Mesocricetus auratus*)	0/547	mg/L	DR	14	days	11	weeks	GE	female	MORT	WO	547		Yes	0.163	No	1.93E-02	64.9		Carpenter, 1982
Lead acetate	100	Rat (*Rattus norvegicus*)	0/10/50/100/1000	mg/kg diet	FD	92	weeks	21	days	JV	both	SURV	WO	1000		Yes	0.615	No	4.61E-02	74.9		Jessup and Shott, 1969
Lead acetate	100	Rat (*Rattus norvegicus*)	0/10/100/1000	mg/kg diet	FD	8	weeks	NR	NR	GE	both	SURV	WO	1000		Yes	0.46	No	3.63E-02	78.8		Jessup, 1969
Lead acetate	100	Rat (*Rattus norvegicus*)	0/1130/2102	mg/kg diet	FD	2	year	NR	NR	NR	male	MORT	WO	1130	2102	No	0.51	No	3.95E-02	87.5	163	Azar et al., 1973
Lead acetate trihydrate	100	Rat (*Rattus norvegicus*)	0/0.78/20.64/41.24/103.63	mg/kg bw/d	DR	24	weeks	94	days	JV	male	MORT	WO	104		Yes	0.75394	Yes	2.60E-02	104		Wolfe et al., 1996
Lead acetate	100	Rat (*Rattus norvegicus*)	0/68	mg/org/d	FD	24	weeks	NR	NR	YO	male	MORT	WO	68.0		Yes	0.400	No	3.24E-02	170		Lessler and Wright, 1976
Lead acetate	100	Rat (*Rattus norvegicus*)	0/68	mg/org/d	FD	8	weeks	NR	NR	MA	male	MORT	WO	68.0		Yes	0.4	No	3.24E-02	170		Lessler and Wright, 1976
Lead acetate	100	Mouse (*Mus musculus*)	0/2732	mg/L	DR	10	month	NR	NR	AD	male	MORT	WO	2732		Yes	0.034	No	4.72E-03	379		Ogilvie and Martin, 1981
Lead acetate	54.61	Mouse (*Mus musculus*)	0/0.5	% in water	DR	98	days	50-100	days	GE	female	MORT	WO	0.500		Yes	0.018	No	2.66E-03	404		Rasile et. al. 1995
Lead acetate	100	Rat (*Rattus norvegicus*)	0/216/420/639.36	mg/kg bw/d	DR	18	weeks	NR	NR	JV	male	MORT	WO	639		Yes	0.25	Yes	4.00E-02	639		Piasekand Kostial, 1987
Lead acetate	100	Rat (*Rattus norvegicus*)	0/5	mg/L	DR	727	days	30	days	JV	female	LFSP	WO		5.00	No	0.248	No	2.82E-02		0.569	Kanisawa and Schroeder, 1969
Lead acetate	100	Cattle (*Bos taurus*)	0/2.7/5.0/20	mg/kg bw/d	DR	21	days	10	weeks	JV	male	MORT	WO		2.70	Yes	55	No	3.65E+00		2.70	Zmudski et al., 1983
Lead	100	Rat (*Rattus norvegicus*)	0/25	mg/L	DR	6	month	28	days	JV	both	SURV	WO		25.0	Yes	0.2251	No	2.59E-02		2.87	Schroeder et al., 1963
Divalent Lead	100	Mouse (*Mus musculus*)	0/25	mg/L	DR	21	month	21	days	JV	male	SURV	WO		25.0	No	0.0375	Yes	4.65E-03		3.10	Schroeder et al., 1964
Lead acetate	100	Cattle (*Bos taurus*)	0/20	mg/kg bw/d	DR	8	days	3	months	JV	male	MORT	WO		20.0	No	na	No	na		20.0	Wells, et.al, 1986
Lead	100	Shrew (*Sorex araneus*)	0/371/423/1052	mg/kg diet	FD	31	days	NR	NR	JV	both	MORT	WO		371	Yes	0.0071	No	1.18E-03		61.5	Pankakoski et al., 1994
Lead acetate	100	Mouse (*Mus musculus*)	0/0.5/1.0/2.0/3.0/4.0	% in diet	FD	115	days	NR	NR	AD	both	SURV	WO		0.500	No	0.0317	No	4.03E-03		635	Eyden et al., 1978
Lead acetate trihydrate	100	Mouse (*Mus musculus*)	0/4.98/10.055/20.52	mg/ml	DR	18	weeks	11	weeks	JV	both	MORT	WO		4.84	Yes	0.0369	Yes	4.85E-03		670	Gulati et al., 1985
Lead acetate trihydrate	100	Mouse (*Mus musculus*)	0/0.67/1.00/1.50	g/kg bw/d	DR	105	days	6	weeks	JV	both	MORT	WO		0.670	Yes	0.0376	No	5.17E-03		670	Lamb et al., 1997
Manganese																						
Reproduction																						
Manganese sulfate monohydrate	100	Pig (*Sus scrofa*)	0/120	mg/kg diet	FD	124	days	9	weeks	GE	female	PROG	WO	120		Yes	99.92641	Yes	2.36E+00	2.83		Grummer et al., 1950
Manganese (II) chloride	43.66	Rat (*Rattus norvegicus*)	0/0.35/1.42	mg/g bw/d	DR	30	days	NR	NR	GE	female	PRWT	WO	0.35	1.42	No	0.338	No	3.73E-03	153	620	Pappas et al., 1997
Manganese (II) chloride	43.66	Rat (*Rattus norvegicus*)	0/0.18/0.30/0.45	g/d	DR	21	days	NR	NR	GE	female	PRWT	WO	0.3	0.45	Yes	0.4738	Yes	2.96E-02	276	415	Kontur and Fechter, 1985
Manganese oxide	100	Rat (*Rattus norvegicus*)	0/350/1050/3500	mg/kg diet	FD	43	days	NR	NR	GE	female	PRWT	WO	3500		No	0.344	No	2.86E-02	291		Laskey et al., 1982
Manganese chloride tetrachloride	100	Rat (*Rattus norvegicus*)	0/10/20	mg/ml	DR	26	days	NR	NR	GE	female	PRWT	WO	10	20	No	0.462	No	4.94E-02	1069	2139	Leung et al., 1982
Manganese chloride tetrahydrate	100	Rat (*Rattus norvegicus*)	0/0.00998/0.02495/0.0499/0.099g/org/d		FD	730	days	NR	NR	JV	male	TEDG	TE	0.0998		Yes	0.05	Yes	1.00E-02	1996		Becker and McCollum, 1938
Manganese sulfate dihydrate	24.07	Rat (*Rattus norvegicus*)	0/1000	mg/L	DR	12	weeks	NR	NR	AD	male	TEWT	TE		1000	Yes	0.36266	No	3.97E-02		26.4	Bataineh et al., 1998
Growth																						
Manganese sulfate monohydrate	100	Cattle (*Bos taurus*)	0/50	mg/kg diet	FD	10	weeks	22-28	weeks	JV	male	BDWT	WO	50		Yes	229.8	No	6.00E+00	1.30		Ivan and Grieve, 1975
Manganese sulfate	100	Water buffalo (*Bubalus carabanensis*)	0/574.68/697.68	mg/org/d	FD	90	days	13-19	months	JV	male	BDWT	WO	697.68		Yes	375.33	No	8.98E+00	1.86		Mohamed et al., 1986
Manganese oxide	100	Pig (*Sus scrofa*)	0/100	mg/kg	FD	84	days	NR	NR	JV	both	BDWT	WO	50		Yes	87.86	Yes	2.41E+00	2.74		Svajgr et al., 1969
Manganese sulfate monohydrate	100	Pig (*Sus scrofa*)	0/120	mg/kg diet	FD	124	days	9	weeks	JV	both	BDWT	WO	120		Yes	99.92641	Yes	2.36E+00	2.83		Grummer et al., 1950
Manganese (II) chloride	100	Rat (*Rattus norvegicus*)	0/75	mg/kg diet	FD	80	days	44	days	JV	male	BDWT	WO	75		Yes	0.47	No	3.69E-02	5.89		Gershbein et al 1983
Manganese chloride	100	Cattle (*Bos taurus*)	0/100/250	mg/kg diet	FD	66	days	1	year	JV	female	BDWT	WO	250		Yes	146.5	Yes	4.13E+00	7.05		Bhoot et al., 1981
Manganese chloride	100	Rat (*Rattus norvegicus*)	0/43.8/82.4	mg/kg diet	FD	2	weeks	NR	NR	JV	both	BDWT	WO	82.4		Yes	0.227	No	2.03E-02	7.37		Lee and Johnson, 1988
Manganese sulfate	100	Pig (*Sus scrofa*)	0/40/400/4000	mg/kg diet	FD	10	weeks	2	weeks	JV	both	BDWT	WO	400	4000	Yes	37.3	No	1.35E+00	14.4	144	Leibholz et al., 1962
Manganese sulfate	100	Cattle (*Bos taurus*)	0/820/2460/4920	mg/kg diet	FD	84	days	10	weeks	JV	male	BDWT	WO	820	2460	Yes	229	Yes	6.05E+00	21.7	65.0	Cunningham et al., 1966
Manganese oxide	100	Sheep (*Ovis aries*)	0/500/1000/2000/4000	mg/kg diet	FD	84	days	NR	NR	JV	male	BDWT	WO	2000	4000	Yes	38.4	Yes	1.14E+00	59.4	119	Black et al., 1985
Manganese sulfate	100	Cattle (*Bos taurus*)	0/1000/2000/3000	mg/kg diet	FD	100	days	10	weeks	JV	male	BDWT	WO	3000		Yes	219	Yes	5.39E+00	73.8		Cunningham et al., 1966
Manganese sulfate	100	Pig (*Sus scrofa*)	0/25/75/225/675/2025	mg/kg diet	FD	6	weeks	2	weeks	JV	both	BDWT	WO	2025		Yes	14.6	No	6.22E-01	86.3		Leibholz et al., 1962
Manganese chloride tetrahydrate	100	Rat (*Rattus norvegicus*)	0/1	mg/ml	DR	65	weeks	6	weeks	JV	male	BDWT	WO	1		Yes	0.739	No	7.54E-02	102		Nachtman et al., 1986
Manganese carbonate	100	Sheep (*Ovis aries*)	0/2000/4000/8000	mg/kg diet	FD	84	days	NR	NR	JV	male	BDWT	WO	4000	8000	Yes	39.8	Yes	1.11E+00	112	223	Black et al., 1985
Manganese (II) chloride	43.66	Rat (*Rattus norvegicus*)	0/0.18/0.30/0.45	g/d	DR	21	days	NR	NR	GE	female	BDWT	WO	0.18	0.3	Yes	0.48418	Yes	3.58E-02	162	271	Kontur and Fechter, 1985
Manganese carbonate	100	Mouse (*Mus musculus*)	0/2	g/kg diet	FD	100	days	6	weeks	JV	male	BDWT	WO	2		Yes	0.0282	Yes	3.70E-03	262		Komura and Sakamoto, 1991
Manganese dioxide	100	Mouse (*Mus musculus*)	0/2	g/kg diet	FD	100	days	6	weeks	JV	male	BDWT	WO	2		Yes	0.0282	Yes	3.80E-03	270		Komura and Sakamoto, 1991
Manganese carbonate	100	Rat (*Rattus norvegicus*)	0/450/4550	mg/kg diet	FD	56	days	NR	NR	JV	male	BDWT	WO	4550		Yes	0.272	No	2.36E-02	394		Johnson and Kies, 1987
Manganese chloride tetrahydrate	100	Rat (*Rattus norvegicus*)	0/554	mg/kg bw/d	DR	11	weeks	3	weeks	JV	male	BDWT	WO	554		Yes	0.445	Yes	2.70E-02	554		Gaillard et al., 1996
Manganese acetate	100	Mouse (*Mus musculus*)	0/2	g/kg diet	FD	30	days	6	weeks	JV	male	BDWT	WO		2	Yes	0.0282	Yes	4.00E-03		284	Komura and Sakamoto, 1991
Manganese chloride tetrahydrate	100	Mouse (*Mus musculus*)	0/2	g/kg diet	FD	30	days	6	weeks	JV	male	BDWT	WO		2	Yes	0.0282	Yes	4.00E-03		284	Komura and Sakamoto, 1991
Mercury																						
Reproduction																						
Mercuric chloride	73.9	Mink (Mustela vison)	10	ppm	FD	6	month	NR	NR	AD	NR	GREP	WO	1.01		yes	1.00E+00	yes	0.14	1		Auleric et al, 1974
Methyl mercury chloride	79.89	Rat (*Rattus norvegicus*)	0.1/0.5/2.5	ppm	FD	3	generation	NR	NR	NR	NR	GREP	WO	0.5		yes	3.50E-01	yes	0.03	0.032	0.16	Vershuuren et al, 1976
Survival																						
Methyl mercury chloride	79.89	Mink (Mustela vison)	1.1/1.8/4.8/8.3/15	ppm	FD	93	days	NR	NR	NR	NR	GMOR	WO	0.15		yes	1	yes	0.14	0.02	0.025	Wobeser et al, 1976
Mercuric sulfide	NR	Mouse (*Mus musculus*)	≤13.2	mg/kg/d	FD	20	month	NR	NR	NR	NR	GMOR	WO	13.2		yes	0.03	no	NR	13.20		Revis et al, 1989
Molybdenum																						
Reproduction																						
Molybdate		Mouse (*Mus musculus*)	2.585	mg/kg/d	DR	3	generation	NR	NR	NR	NR	GREP	WO	2.5	0.0825	Yes	0.03	Yes	0.0075	0.26	2.6	Schroeder and Mitchner, 1971
Nickel																						
Reproduction																						
Nickel chloride hexahydrate	100	Rat (*Rattus norvegicus*)	0/10/30/100	mg/L	DR	28	days	3.5-9	months	SM	male	GIDX	WO	10.0	30.0	Yes	0.3379	No	3.73E-02	1.10	3.31	Kakela et al., 1999
Nickel sulfate	37.93	Mouse (*Mus musculus*)	0/3.57/7.14/14.29	mg/kg bw/d	OR	35	days	NR	months	JV	male	SPCL	SM	7.14	14.29	Yes	0.025	No	3.31E-03	1.35	2.71	Pandey and Srivastava, 2000

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Nickelous chloride	45.29	Mouse (*Mus musculus*)	0/3.57/7.14/14.29	mg/kg bw/d	OR	35	days	NR	NR	JV	male	SPCL	SM	3.57	7.14	Yes	0.025	No	3.31E-03	1.70	3.40	Pandey and Srivastava, 2000
Nickel carbonate	100	Rat (*Rattus norvegicus*)	0/.25/.5/1	mg/g diet	FD	4	month	4	weeks	GE	female	PRWT	WO	1.00		Yes	0.115	Yes	1.07E-03	9.30		Phatak and Patwardhan, 1950
Nickel chloride	100	Mouse (*Mus musculus*)	0/85.3/170.7	mg/kg bw/d	DR	15	days	NR	NR	GE	female	PRFM	WO	85.3	170.7	Yes	0.0297	Yes	5.39E+00	85.3	171	Berman and Rehnberg, 1983
Nickel sulfate hexahydrate	100	Dog (*Canis familiaris*)	0/100/1000/2500	mg/kg diet	FD	24	month	6	months	JV	both	TEWT	TE	2500		No	10.8	No	4.86E-01	112		Ambrose et al., 1976
Nickel sulfate hexahydrate	100	Rat (*Rattus norvegicus*)	0/250/500/1000	mg/kg diet	FD	118	days	28	days	GE	female	PRWT	WO	500	1000	No	0.000156	No	1.00E-04	164	327	Ambrose et al., 1976
Nickel sulfate hexahydrate	100	Rat (*Rattus norvegicus*)	0/100/1000/2500	mg/kg diet	FD	2	year	28	days	JV	male	TEWT	TE	2500		Yes	0.367	No	3.01E-02	205		Ambrose et al., 1976
Nickel	100	Rat (*Rattus norvegicus*)	0/5	mg/L	DR	9	month	21	days	GE	female	DEYO	WO		5.00	No	0.344	No	3.79E-02		0.551	Schroeder and Mitchener, 1971
Nickel chloride	100	Rat (*Rattus norvegicus*)	0/1.33/6.8/31.63	mg/kg bw/d	DR	23	weeks	62	days	LC	female	DEYO	WO		1.33	Yes	0.2689	Yes	2.48E-02		1.33	Smith et al., 1993
Nickel sulfate	100	Rat (*Rattus norvegicus*)	0/44.7/111.75/223.5	mg/L	DR	13	weeks	NR	NR	JV	male	TEWT	TE		44.7	Yes	0.55	No	5.78E-02		4.70	Obone et al., 1999

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Growth																						
Nickel chloride hexahydrate	100	Rat (*Rattus norvegicus*)	0/1	ug/g diet	FD	57	days	NR	NR	JV	male	BDWT	WO	1		Yes	0.315	No	2.66E-02	0.0844		Uthus and Poellot, 1997
Nickel chloride	100	Cattle (*Bos taurus*)	0/5	mg/kg diet	FD	140	days	50	days	JV	male	BDWT	WO	5		Yes	247.6	Yes	5.00E+00	0.101		Spears et al., 1986
Nickel sulfate hexahydrate	22.33	Rat (*Rattus norvegicus*)	0/1.5	mg/kg bw/d	FD	21	days	NR	NR	JV	male	BDWT	WO	1.50		Yes	0.0755	No	8.22E-03	0.335		Chatterjee et al., 1979
Nickel chloride hexahydrate	100	Rat (*Rattus norvegicus*)	0/5/25	mg/kg diet	FD	49	days	1	days	JV	NR	BDWT	WO	25		Yes	8.501	No	3.99E-01	1.17		Spears et al., 1984
Nickel chloride	100	Rat (*Rattus norvegicus*)	0/1.33/6.8/31.63	mg/kg bw/d	DR	15	weeks	62	days	LC	female	BDWT	WO	1.33	6.80	Yes	0.3707	Yes	2.92E-02	1.33	6.80	Smith et al., 1993
Nickel chloride hexahydrate	100	Rat (*Rattus norvegicus*)	0/15/225	mg/kg diet	FD	21	days	NR	NR	JV	male	BDWT	WO	15	225	Yes	0.137	No	1.34E-02	1.47	22.0	Spears and Hatfield, 1985
Nickelous carbonate	100	Cattle (*Bos taurus*)	0/62.5/250/1000	mg/kg diet	FD	8	weeks	14	weeks	JV	male	BDWT	WO	250	1000	Yes	180.08	Yes	1.18E+00	1.64	6.55	O'Dell et al., 1970
Nickel chloride hexahydrate	100	Rat (*Rattus norvegicus*)	0/1.18	mg/org/d	DR	90	days	NR	NR	JV	female	BDWT	WO	1.18		Yes	0.3978	No	4.32E-02	2.97		Cikrt et al., 1992
Nickel chloride trihydrate	100	Rat (*Rattus norvegicus*)	0/5/50	ug/g diet	FD	10	weeks	NR	NR	JV	female	BDWT	WO	50		No	0.204	No	1.86E-02	4.56		Nielsen, 1980
Nickel chloride trihydrate	100	Rat (*Rattus norvegicus*)	0/5/50	ug/g diet	FD	9	weeks	21	days	JV	female	BDWT	WO	50.00		No	0.204	No	1.86E-02	4.56		Nielsen et al., 1979
Nickel	100	Rat (*Rattus norvegicus*)	0/5.44	mg/kg bw/d	DR	1217	days	30	days	JV	both	BDWT	WO	5.44		Yes	0.397	Yes	2.78E-02	5.44		Schroeder et al., 1974
Nickelous chloride	100	Rat (*Rattus norvegicus*)	0/75	mg/kg diet	FD	80	days	44	days	JV	male	BDWT	WO	75		Yes	0.4700	No	3.69E-02	5.89		Gershbein et al 1983
Nickelous carbonate	100	Cattle (*Bos taurus*)	0/365/1835	mg/org/d	FD	6	weeks	NR	NR	LC	female	BDWT	WO	1835		No	272	Yes	7.35E+00	6.75		ODell et al., 1970
Nickelous carbonate	100	Cattle (*Bos taurus*)	0/1.8/7.0/14.6	mg/kg bw/d	FD	8	weeks	13-21	weeks	JV	male	BDWT	WO	7.00	14.6	Yes	183.8	Yes	5.10E+00	7.00	14.6	O'Dell et al., 1971
Nickel chloride	100	Rat (*Rattus norvegicus*)	0/49.5/104.9	mg/kg diet	FD	28	days	31	days	JV	male	BDWT	WO	105		No	0.217	Yes	1.61E-02	7.78		Oosting et al., 1991
Nickel sulfate hexahydrate	100	Rat (*Rattus norvegicus*)	0/100/1000/2500	mg/kg diet	FD	6	weeks	28	days	JV	both	BDWT	WO	100	1000	Yes	0.205	No	1.87E-02	9.11	91.1	Ambrose et al., 1976
Nickel carbonate	100	Rat (*Rattus norvegicus*)	0/.25/.5/1	mg/g diet	FD	8	weeks	4	weeks	JV	both	BDWT	WO	1.00		Yes	0.115	Yes	1.07E-03	9.30		Phatak and Patwardhan, 1950
Nickel acetate	100	Rat (*Rattus norvegicus*)	0/100/500/1000	mg/kg diet	FD	6	weeks	35	days	JV	NR	BDWT	WO	100	500	Yes	0.163	No	1.55E-02	9.49	47.4	Whanger, 1973
Nickel chloride hexahydrate	100	Rat (*Rattus norvegicus*)	0/30/100	mg/L	DR	62	days	3.5-9	months	GE	female	BDWT	WO	100		Yes	0.2357	No	2.70E-02	11.4		Kakela et al., 1999
Nickel sulfate	100	Rat (*Rattus norvegicus*)	0/44.7/111.75/223.5	mg/L	DR	13	weeks	NR	NR	JV	male	BDWT	WO	112	224	Yes	0.575	No	6.02E-02	11.7	23.4	Obone et al., 1999
Nickel chloride hexahydrate	100	Meadow vole (*Microtus pennsylvanicus*)	0/18/100	mg/kg diet	FD	45	days	14	days	JV	NR	BDWT	WO	100		Yes	0.0349	No	4.36E-03	12.5		Alexander et al., 1978
Nickel Chloride	100	Rat (*Rattus norvegicus*)	0/10/20	mg/kg bw/d	FD	14	days	80	days	JV	male	BDWT	WO	20.0		Yes	0.1867	No	1.73E-02	20.0		Nation et al., 1985
Nickel chloride hexahydrate	100	Meadow vole (*Microtus pennsylvanicus*)	0/21/187/1968	mg/kg diet	FD	49	days	14	days	JV	NR	BDWT	WO	187	1968	Yes	0.035	Yes	5.50E-03	29.4	309	Alexander et al., 1978
Nickel sulfate hexahydrate	100	Dog (*Canis familiaris*)	0/100/1000/2500	mg/kg diet	FD	65	weeks	6	months	JV	both	BDWT	WO	1000	2500	No	10.8	No	4.86E-01	45.0	112	Ambrose et al., 1976
Nickel chloride	100	Mouse (*Mus musculus*)	0/85.3/170.7	mg/kg bw/d	DR	15	days	NR	NR	GE	female	BDWT	WO	85.3	170.7	Yes	0.0297	Yes	5.39E+00	85.3	171	Berman and Rehnberg, 1983
Nickel sulfate	37.4	Mouse (*Mus musculus*)	0/115.7/285.7/395.7	mg/kg bw/d	DR	180	days	6-8	weeks	JV	female	BDWT	WO	286	396	Yes	0.028	Yes	1.60E-03	107	148	Dieter et al., 1988
Nickel chloride hexahydrate	100	Rat (*Rattus norvegicus*)	0/30	mg/kg diet	FD	21	days	NR	NR	JV	male	BDWT	WO		30	Yes	0.175	No	1.64E-02		2.81	Spears and Hatfield, 1985
Nickel chloride	100	Rat (*Rattus norvegicus*)	0/100	mg/kg diet	FD	28	days	31	days	JV	male	BDWT	WO		100	No	0.217	Yes	1.78E-02		8.20	Oosting et al., 1991
Nickel chloride	100	Rat (*Rattus norvegicus*)	0/225	mg/L	DR	4	month	NR	NR	JV	male	BDWT	WO		225	Yes	0.356	No	3.91E-02		24.7	Clary, 1975
Nickel acetate	100	Mouse (*Mus musculus*)	0/4.143/6.143	mg/org/d	FD	4	weeks	NR	NR	JV	female	BDWT	WO		4.143	Yes	0.0199	Yes	3.78E-03		208	Weber and Reid, 1969
Survival																						
Nickel chloride trihydrate	100	Rat (*Rattus norvegicus*)	0/5/50	ug/g diet	FD	11	weeks	NR	NR	JV	female	MORT	WO	50.0		No	0.204	No	1.86E-02	4.56		Nielsen et al 1982
Nickel sulfate	37.93	Mouse (*Mus musculus*)	0/3.57/7.14/14.29	mg/kg bw/d	OR	35	days	NR	NR	JV	male	MORT	WO	14.29		Yes	0.025	No	3.31E-03	5.42		Pandey and Srivastava, 2000
Nickelous chloride	45.29	Mouse (*Mus musculus*)	0/3.57/7.14/14.29	mg/kg bw/d	OR	35	days	NR	NR	JV	male	MORT	WO	14.29		Yes	0.025	No	3.31E-03	6.47		Pandey and Srivastava, 2000
Nickel chloride hexahydrate	100	Meadow vole (*Microtus pennsylvanicus*)	0/21/187/1968	mg/kg diet	FD	14	days	14	days	JV	NR	MORT	WO	187	1968	Yes	0.035	Yes	5.50E-03	29.4	309	Alexander et al., 1978
Nickel sulfate hexahydrate	100	Dog (*Canis familiaris*)	0/100/1000/2500	mg/kg diet	FD	24	month	6	months	JV	both	MORT	WO	2500		No	10.8	No	4.86E-01	112		Ambrose et al., 1976
Nickel chloride hexahydrate	100	Rat (Rattus norvegicus)	0/7.9/29.0	mg/org/d	DR	90	days	NR	NR	JV	male	MORT	WO	29		Yes	0.21	Yes	2.42E-05	138		Cempel and Janicka, 2002
Nickel sulfate hexahydrate	100	Rat (*Rattus norvegicus*)	0/100/1000/2500	mg/kg diet	FD	24	month	28	days	JV	both	MORT	WO	2500		Yes	0.367	No	3.01E-02	205		Ambrose et al., 1976
Divalent Nickel	100	Mouse (*Mus musculus*)	0/5	mg/L	DR	16	month	21	days	JV	both	SURV	WO		5.00	No	0.0375	Yes	4.70E-03		0.62	Schroeder et al., 1964
Nickelous acetate	100	Mouse (*Mus musculus*)	0/5	mg/L	DR	520	days	19-20	days	AD	female	LFSP	WO		5.00	Yes	0.025	No	3.58E-03		0.716	Schroeder and Mitchener, 1975
PAHs - Low Molecular Weight																						
Reproduction																						
Naphthalene	100	Rat (*Rattus norvegicus*)	0/24.5/88.3/294.1	mg/kg bw/d	FD	4	weeks	NR	NR	JV	NR	TEWT	TE	294		Yes	0.3070	Yes	2.07E-02	294		Anonymous, 1992
Growth																						
2-Methylnaphthalene	97	Mouse (*Mus musculus*)	0/54.3/113.8	mg/kg bw/d	FD	81	weeks	6	weeks	JV	male	BDWT	WO	54.3	114	Yes	0.0400	No	4.87E-03	52.7	110	Murata et al., 1997
1-Naphthaleneacetic acid	100	Rat (*Rattus norvegicus*)	0/200/1000/5000	mg/kg	FD	6	weeks	NR	NR	JV	male	BDWT	WO	1000	5000	Yes	0.247	Yes	1.62E-02	65.6	328	Verschuuren et al., 1976
3-Methylnaphthalene	97	Mouse (*Mus musculus*)	0/50.3/107.6	mg/kg bw/d	FD	81	weeks	6	weeks	JV	female	BDWT	WO	108		Yes	0.044	No	5.27E-03	104		Murata et al., 1997
Naphthalene	100	Rat (*Rattus norvegicus*)	0/24.5/88.3/294.1	mg/kg bw/d	FD	4	weeks	NR	NR	JV	NR	BDWT	WO	294		Yes	0.3070	Yes	2.07E-02	294		Anonymous, 1992
Fluoranthene	98	Rat (*Rattus norvegicus*)	0/160/740/1490	mg/kg bw/d	FD	60	days	6-7	weeks	JV	male	BDWT	WO	740	1490	No	0.180	No	1.68E-02	725	1460	Ramesh et. al, 2000
Fluoranthene	98	Rat (Rattus norvegicus)	0/150/750/1500	mg/kg bw/d	FD	90	days	9	weeks	JV	male	BDWT	WO	750	1500	Yes	0.16	No	1.52E-02	735	1470	Knuckles et al., 2004
Survival																						
Naphthalene	100	Rat (*Rattus norvegicus*)	0/24.5/88.3/294.1	mg/kg bw/d	FD	4	weeks	NR	NR	JV	NR	MORT	WO	294		Yes	0.307	Yes	2.07E-02	294		Anonymous, 1992
PAHs - High Molecular Weight																						
Reproduction																						
6-Aminochrysene	100	Rat (*Rattus norvegicus*)	0/13.3/26.4	mg/kg bw/d	FD	3	month	1	months	GE	female	PROG	WO	13.3	26.4	Yes	0.2650	No	1.37E-02	13.3	26.4	Lambelin et al., 1967
Benzo(a)pyrene	100	Mouse (*Mus musculus*)	0/0.25	mg/g	FD	17	days	NR	NR	LC	female	PRWT	WO		0.25	Yes	0.0040	No	7.34E-04		45.9	Rigdon an d Neal, 1965
Growth																						
Benzo(a)pyrene	100	Mouse (*Mus musculus*)	0/5/25/100	mg/kg diet	FD	55	weeks	5	weeks	JV	both	BDWT	WO	25	100	Yes	0.037	No	4.57E-03	3.09	12.4	Culp et al., 1998
6-Aminochrysene	100	Rat (*Rattus norvegicus*)	0/11.8/24.0	mg/kg bw/d	FD	360	days	1	months	JV	male	BDWT	WO	11.8	24.0	Yes	0.39200	No	1.70E-02	11.8	24.0	Lambelin et al., 1967
6-Aminochrysene	100	Rat (*Rattus norvegicus*)	0/13.3/26.4	mg/kg bw/d	FD	360	days	1	months	JV	female	BDWT	WO	13.3	26.4	Yes	0.26500	No	1.37E-02	13.3	26.4	Lambelin et al., 1967
Benzo(a)pyrene	100	Mouse (*Mus musculus*)	0/0.001/0.01/0.25	mg/g	FD	66	days	18-30	days	JV	NR	BDWT	WO	0.25		Yes	0.0320	No	4.06E-03	31.7		Rigdon et al., 1967
Benzo(a)pyrene	98	Rat (*Rattus norvegicus*)	0/5/50/100	mg/kg bw/d	FD	60	days	9	weeks	JV	male	BDWT	WO	50	100	Yes	0.160	No	1.52E-02	49.0	98.0	Knuckles et al., 2001
Benzo(a)pyrene	98	Rat (*Rattus norvegicus*)	0/5.3/55/120	mg/kg bw/d	FD	60	days	6-7	weeks	JV	male	BDWT	WO	55	120	No	0.180	No	1.68E-02	53.9	118	Ramesh et. al, 2000
Benzo(a)pyrene	100	Mouse (*Mus musculus*)	0/1.25/12.5/125	mg/kg bw/d	FD	18	days	NR	NR	JV	male	BDWT	WO	125		Yes	0.024	No	3.20E-03	125		Uno et al., 2006
7,12-Dimethylbenz(a)anthracene	100	Rat (*Rattus norvegicus*)	0/0.025	% in diet	FD	12	weeks	12	weeks	JV	male	BDWT	WO		0.025	Yes	0.3510	No	2.91E-02		20.7	Reuber and Glover, 1969
Benzo(a)pyrene	100	Mouse (*Mus musculus*)	0/0.25	mg/g	FD	6	days	20	days	JV	male	BDWT	WO		0.25	Yes	0.0110	Yes	1.20E-03		27.3	Rigdon an d Neal, 1965
Survival																						
Benzo(a)pyrene	100	Mouse (*Mus musculus*)	0/5/25/100	mg/kg diet	FD	55	weeks	5	weeks	JV	both	MORT	WO	5	25	Yes	0.0380	No	4.67E-03	0.615	3.01	Culp et al., 1998
6-Aminochrysene	100	Rat (*Rattus norvegicus*)	0/13.3/26.4	mg/kg bw/d	FD	3	month	1	months	GE	female	MORT	WO	13.3	26.39	Yes	0.265	No	1.37E-02	13.3	26.39	Lambelin et al., 1967
Benzo(a)pyrene	100	Mouse (*Mus musculus*)	0/0.25	mg/g	FD	6	days	20	days	JV	male	MORT	WO	0.25		Yes	0.0110	Yes	1.20E-03	27.3		Rigdon an d Neal, 1965
Benzo(a)pyrene	100	Mouse (*Mus musculus*)	0/0.001/0.01/0.25	mg/g	FD	77	days	18-30	days	JV	NR	MORT	WO	0.25		Yes	0.032	No	4.06E-03	31.7		Rigdon et al., 1967
PCBs																						
Reproduction																						

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Aroclor 1016	NR	Mink (*Mustela vison*)	2/10/2025	ppm	FD	18	month	NR	NR	NR	NR	GREP	WO	10.00	25	yes	1.000	yes	1.37E-01	1.4	3.425	Aulerich and Ringer, 1980
Aroclor 1242	NR	Mink (*Mustela vison*)	5/10/20/40	ppm	FD	7	month	NR	NR	NR	NR	GREP	WO		5	yes	1.000	yes	1.37E-01	0.1	0.69	Bleavins et al, 1980
Aroclor 1248	NR	Rhesus Monkey (*Macaca mulatta*)	2.5/5	ppm	FD	14	month	NR	NR	NR	NR	GREP	WO		2.5	yes	5.000	yes	2.00E-01	0.0	0.1	Barsotti et al, 1976
Aroclor 1254	NR	Oldfield mouse (*Permyscus poliontus*)	5	ppm	FD	12	month	NR	NR	NR	NR	GREP	WO		0.68	yes	0.014	yes	1.90E-03	0.1	0.68	McCoy et al, 1995
Aroclor 1254	NR	Mink (*Mustela vison*)	1/5/15	ppm	FD	5	month	NR	NR	NR	NR	PROG	WO	1.00		yes	1.000	yes	1.37E-01	0.1	0.69	Aulerich and Ringer, 1977

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Selenium																						
Reproduction																						
Sodium selenite pentahydrate	100	Mouse (*Mus musculus*)	0/3/6	mg/L	DR	56	days	60	days	GE	female	PRWT	WO	3	6	Yes	0.170	Yes	4.10E-03	0.072	0.145	Nobunaga et al., 1979
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/1.3	mg/kg diet	FD	14	weeks	NR	NR	GE	female	ODVP	WO	1.3		No	0.35	No	2.90E-02	0.108		Fredriksson et al., 1993
Sodium selenite	100	Cattle (*Bos taurus*)	0/26	mg/kg diet	FD	42	weeks	NR	NR	GE	female	PRWT	WO	26		Yes	498	No	3.32E+00	0.173		Gunter et al., 2003
Sodium selenite	45.66	Rat (*Rattus norvegicus*)	0/4/8/16	mg/L	DR	240	days	NR	NR	JV	male	TEWT	TE	8	16	Yes	0.550	No	5.78E-02	0.384	0.768	Nebbia et al., 1987
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/5/10/20	mg/kg diet	FD	5	weeks	NR	NR	JV	male	SPCL	GO	5	10	Yes	0.2925	Yes	2.27E-02	0.388	0.776	Kezhou et al., 1987
Sodium selenite	45.66	Rat (*Rattus norvegicus*)	0/0.17/0.28/0.50/0.86/1.67	mg/kg bw/d	DR	13	weeks	6	weeks	JV	female	GREP	WO	0.86	1.67	Yes	0.188	Yes	9.20E-03	0.393	0.763	Abdo, 1994
sodium selenite	100	Rat (*Rattus norvegicus*)	0/0.1/1/2.5/5	mg/kg diet	FD	42	days	90	days	GE	female	PROG	WO	5		Yes	0.204	No	1.86E-02	0.456		Halverson, 1974
Sodium selenite	45.66	Mouse (*Mus musculus*)	0/0.26/0.56/0.91/1.61/3.31	mg/kg bw/d	DR	13	weeks	6	weeks	JV	male	GREP	WO	1.61	3.31	Yes	0.0338	Yes	4.70E-03	0.735	1.51	Abdo, 1994
Sodium selenate	100	Sheep (*Ovis aries*)	0/24	mg/kg diet	FD	88	days	NR	months	GE	female	PRWT	WO	24		Yes	67	No	2.18E+00	0.780		Panter et al., 1995
Selenium	100	Sheep (*Ovis aries*)	0/29	mg/kg diet	FD	88	days	NR	NR	GE	female	PRWT	WO	29		Yes	66	No	2.15E+00	0.945		Panter et al., 1995
Sodium selenite	45.66	Mouse (*Mus musculus*)	0/7.6/66/330	ug/org/d	DR	29	days	8	weeks	GE	female	PRWT	WO	66	330	Yes	0.025	No	3.58E-03	1.21	6.03	Hau et al., 1987
Sodium selenate	41.79	Mouse (*Mus musculus*)	0/0.55/1.07/1.87/2.95/5.45	mg/kg bw/d	DR	13	weeks	6	weeks	JV	both	SPCL	TE	5.45		Yes	0.0302	Yes	2.50E-03	2.28		Abdo, 1994
Sodium selenite	100	Mouse (*Mus musculus*)	0/0.05/2/20/200	mg/kg diet	FD	19	days	4	months	GE	female	PRWT	WO	20	200	Yes	0.032	No	4.06E-03	2.54	25.4	Webster, 1979
Sodium selenite	45.66	Rat (*Rattus norvegicus*)	0/2/4	mg/kg diet	FD	5	weeks	NR	NR	JV	male	SPCV	TE		2	Yes	0.14	No	1.37E-02		0.0890	Kaur and Parshad, 1994
Sodium selenate	41.79	Rat (*Rattus norvegicus*)	0/0.31/0.47/0.88/1.35/1.84	mg/kg bw/d	DR	13	weeks	6	weeks	JV	female	GREP	WO		0.31	Yes	0.196	Yes	1.47E-02		0.130	Abdo, 1994
Sodium selenite	100	Pig (*Sus scrofa*)	0/10	mg/kg diet	FD	239	days	8	weeks	GE	female	PRWT	WO		10	Yes	113.3981	No	3.36E+00		0.296	Wahlstrom and Olson, 1959
Sodium selenate	100	Mouse (*Mus musculus*)	0/3	mg/L	DR	6	month	21	days	JV	female	DEYO	WO		3	No	0.0225	No	3.26E-03		0.434	Schroeder and Mitchener, 1971
Sodium selenite	45.66	Rat (*Rattus norvegicus*)	0/10/15	mg/L	DR	21	days	NR	NR	LC	female	PRWT	WO		10	No	0.338	No	3.73E-02		0.504	Thorlacius-Ussing, 1990
Selenium	100	Rat (*Rattus norvegicus*)	0/12.5	mg/kg diet	FD	4	weeks	NR	NR	JV	male	TEWT	TE		12.5	Yes	0.1476	Yes	6.50E-03		0.550	Parshad and Sud, 1989
sodium selenite	45	Rat (*Rattus norvegicus*)	0/15	mg/L	DR	21	days	NR	months	LC	female	PRWT	WO		15	No	0.32	No	3.55E-02		0.749	Thorlacius-Ussing et al., 1987
sodium selenite	45.66	Mouse (*Mus musculus*)	0/10	mg/kg bw/d	OR	5	days	90	days	GE	female	PROG	WO		10	No	0.00215	No	4.41E-04		4.57	Gray and Kavlock, 1984
Growth																						
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/1/5	mg/kg diet	FD	8	weeks	NR	NR	JV	male	BDWT	WO	1	5	Yes	0.330	Yes	1.75E-02	0.053	0.265	Shull and Checke, 1973
Selenous acid	100	Rat (*Rattus norvegicus*)	0/1.0	mg/kg diet	FD	30	days	NR	NR	JV	male	BDWT	WO	1		Yes	0.24	Yes	1.54E-02	0.0642		Meyer et al 1982
Selenium	100	Rat (*Rattus norvegicus*)	0/0.94/85.6	mg/kg diet	FD	4	weeks	NR	NR	JV	NR	BDWT	WO	0.94	8.56	Yes	0.232	No	2.07E-02	0.0838	0.763	Palmer et al., 1982
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/1	mg/kg diet	FD	2	weeks	NR	NR	JV	male	BDWT	WO	1		Yes	0.2671	No	2.32E-02	0.0869		Chen et al., 1990
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/0.09	mg/kg bw/d	DR	4	weeks	NR	NR	JV	male	BDWT	WO	0.09		Yes	0.29	No	3.25E-02	0.090		Glattre et al., 1995
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/110.1	mg/kg bw/d	FD	2	weeks	NR	NR	JV	male	BDWT	WO	110.1		Yes	0.2686	No	2.33E-02	0.110		Debski et al., 1992
Sodium selenite or Se-yeast	100	Pig (*Sus scrofa*)	0/1.0/3.0/5.0/7.0/10.0	mg/kg diet	FD	12	weeks	NR	NR	JV	both	BDWT	WO	5	7	Yes	104	Yes	2.34E+00	0.112	0.157	Kim and Mahan, 2001
Sodium selenite	100	Pig (*Sus scrofa*)	0/5/10/15/20	mg/kg diet	FD	12	weeks	8	weeks	JV	both	BDWT	WO	5	10	Yes	84.5	Yes	2.31E+00	0.137	0.273	Kim and Mahan, 2001
Sodium selenite	100	Pig (*Sus scrofa*)	0/2.5/5/7.5/10/20/40	mg/kg diet	FD	37	days	4	weeks	JV	both	BDWT	WO	5	7.5	Yes	17.8	Yes	5.10E-01	0.143	0.215	Mahan and Moxon, 1984
Sodium selenite	100	Pig (*Sus scrofa*)	0/4.20/7.84/11.27/16.43/20.45	ug/g diet	FD	5	weeks	NR	NR	JV	both	BDWT	WO	4.2	7.84	Yes	22.7	Yes	7.90E-01	0.146	0.273	Goehring et. al. 1983
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/0.509/2.003/4.05	mg/kg diet	FD	2	weeks	45	days	JV	female	BDWT	WO	2.003	4.05	Yes	0.177	Yes	1.33E-02	0.151	0.304	Liu et al., 1994
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/2	mg/kg diet	FD	2	weeks	41	days	JV	female	BDWT	WO	2		Yes	0.1658	Yes	1.27E-02	0.153		Liu and Milner, 1992
Sodium selenite	100	Pig (*Sus scrofa*)	0/3/7/10	mg/kg diet	FD	14	weeks	NR	NR	JV	female	BDWT	WO	7	10	Yes	100	Yes	2.21E+00	0.155	0.221	Kim and Mahan, 2001
sodium selenite	100	Rat (*Rattus norvegicus*)	0/2	mg/kg diet	FD	110	days	30	days	JV	male	BDWT	WO	2		Yes	0.382	No	3.12E-02	0.163		Behne et al., 1992
Sodium selenate	100	Cattle (*Bos taurus*)	0/1.0/3.0/5.0/10.0	mg/kg diet	FD	6	weeks	3	days	JV	male	BDWT	WO	5	10	Yes	61.5	No	2.03E+00	0.165	0.330	Jenkins and Hidiroglou, 1986
Sodium selenite	100	Pig (*Sus scrofa*)	0/5.0/15.0	mg/kg diet	FD	35	days	23	days	JV	both	BDWT	WO	5	15	Yes	31.5	Yes	1.07E+00	0.170	0.510	Mahan and Magee, 1991
Sodium selenite	100	Cattle (*Bos taurus*)	0/26	mg/kg diet	FD	42	weeks	NR	NR	GE	female	BDWT	WO	26		Yes	498	No	3.32E+00	0.173		Gunter et al., 2003
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/2.09/3.01	mg/L	DR	42	days	21	days	JV	male	BDWT	WO	3.01		Yes	0.248	Yes	1.50E-02	0.181		Palmer and Olson, 1974
Calcium selenite	100	Pig (*Sus scrofa*)	0/5.0/15.0	mg/kg diet	FD	35	days	23	days	JV	both	BDWT	WO	5	15	Yes	31.5	Yes	1.15E+00	0.183	0.548	Mahan and Magee, 1991
Sodium selenite	100	Pig (*Sus scrofa*)	0/2.8/5.2	mg/kg diet	FD	61	days	5-7	weeks	JV	both	BDWT	WO	5.2		Yes	42.1	Yes	1.53E+00	0.189		Mandisodza et al., 1979
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/2.11/2.99	mg/L	DR	42	days	21	days	JV	male	BDWT	WO	2.99		Yes	0.26	Yes	1.66E-02	0.191		Palmer and Olson, 1974
Sodium Selenite	100	Rat (*Rattus norvegicus*)	0/2.5	mg/kg diet	FD	8	weeks	NR	NR	JV	male	BDWT	WO	2.5		Yes	0.455	No	3.60E-02	0.198		Coudray, et. al. 1996
Selenium	100	Pig (*Sus scrofa*)	0/3.4/6	mg/kg diet	FD	61	days	5-7	weeks	JV	both	BDWT	WO	6		Yes	40.7	Yes	1.37E+00	0.202		Mandisodza et al., 1979
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/0.5/2.5	ug/g diet	FD	6	weeks	NR	NR	JV	male	BDWT	WO	2.5		Yes	0.289	No	2.75E-02	0.214		Salbe and Levander, 1990
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/2.5/5/10	ug/g diet	FD	6	weeks	21	days	JV	male	BDWT	WO	2.5	5	No	0.267	No	2.32E-02	0.217	0.435	McAdam and Levander, 1987
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/2.63/5.69/8.33	mg/kg diet	FD	4	weeks	NR	NR	JV	male	BDWT	WO	2.63	5.69	Yes	0.354	No	2.93E-02	0.217	0.470	Goehring et al., 1984
Selenomethionine	100	Rat (*Rattus norvegicus*)	0/0.5/2.5	ug/g diet	FD	6	weeks	NR	NR	JV	male	BDWT	WO	2.5		Yes	0.270	No	2.34E-02	0.217		Salbe and Levander, 1990
sodium selenite	100	Pig (*Sus scrofa*)	0/2.5/5.0/7.5/10/15/20/40	mg/kg diet	FD	37	days	NR	NR	JV	NR	BDWT	WO	5	7.5	Yes	17.43	Yes	7.91E-01	0.227	0.340	Moxon and Mahan, 1982
Se in food (selenium yeast)	100	Pig (*Sus scrofa*)	0/3/7/10	mg/kg diet	FD	14	weeks	NR	NR	JV	female	BDWT	WO	10		Yes	101	Yes	2.38E+00	0.236		Kim and Mahan, 2001
Sodium selenite	100	Mouse (*Mus musculus*)	0/0.24/0.58/1.34	mg/kg bw/d	DR	14	days	7-8	weeks	JV	male	BDWT	WO	0.24	0.58	Yes	0.024	No	3.45E-03	0.240	0.580	Tsunoda et al., 2000
Sodium selenite	100	Mouse (*Mus musculus*)	0/2	mg/kg diet	FD	26	weeks	4	weeks	JV	female	BDWT	WO	2		Yes	0.0316	No	4.02E-03	0.254		Lane et al., 1984
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/3/6	mg/kg diet	FD	6	weeks	NR	NR	JV	male	BDWT	WO	3	6	No	0.267	No	2.32E-02	0.261	0.521	LeBoeuf et al., 1985
Se in food (seleniferous wheat and oats)	100	Pig (*Sus scrofa*)	0/2.58/5.60/8.4	mg/kg diet	FD	6	weeks	NR	NR	JV	both	BDWT	WO	8.4		Yes	31.08	Yes	9.80E-01	0.265		Goehring et al., 1984
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/3.09/6.08/8.87	mg/L	DR	7	days	21	days	JV	male	BDWT	WO	3.09	6.08	Yes	0.066	Yes	9.43E-03	0.274	0.540	Palmer and Olson, 1974
Sodium selenite	45.66	Rabbit (*Oryctolagus cuniculus*)	0/10	mg/kg diet	FD	12	weeks	NR	NR	JV	both	BDWT	WO	10		Yes	2.006	No	1.22E-01	0.277		Turan et al., 1997
Sodium selenite	100	Pig (*Sus scrofa*)	0/10	mg/kg diet	FD	239	days	8	weeks	GE	female	BDWT	WO	10		Yes	113.3981	No	3.36E+00	0.296		Wahlstrom and Olson, 1959
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/2/4	mg/kg diet	FD	2	month	NR	NR	JV	male	BDWT	WO	4		Yes	0.44	No	3.50E-02	0.318		Bioulac-Sage et al., 1992
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/5.0/10.0	mg/kg diet	FD	21	days	4	weeks	JV	both	BDWT	WO	5	10	Yes	0.118	Yes	8.40E-03	0.356	0.712	Julius et al., 1983
Se in food (selenium yeast)	100	Pig (*Sus scrofa*)	0/5/10/15/20	mg/kg diet	FD	12	weeks	8	weeks	JV	both	BDWT	WO	15	20	Yes	83	Yes	2.03E+00	0.367	0.489	Kim and Mahan, 2001
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/1/2/4	mg/kg diet	FD	8	weeks	NR	NR	JV	both	BDWT	WO	4		Yes	0.197	No	1.81E-02	0.367		Yeh et al., 1997
Sodium selenate	41.79	Rat (*Rattus norvegicus*)	0/0.31/0.47/0.88/1.35/1.84	mg/kg bw/d	DR	13	weeks	6	weeks	JV	female	BDWT	WO	0.88	1.35	Yes	0.178	Yes	9.80E-03	0.368	0.564	Abdo, 1994
Sodium selenite	100	Mouse (*Mus musculus*)	0/2	mg/kg diet	FD	8	weeks	6	weeks	JV	male	BDWT	WO	2		Yes	0.02695	Yes	5.00E-03	0.371		Kiremidjian-Schumacher et al., 1992
Selenomethionine	100	Hamster (*Mesocricetus auratus*)	0/5.0/10.0	mg/kg diet	FD	21	days	4	weeks	JV	male	BDWT	WO	5	10	Yes	0.099	Yes	7.40E-03	0.374	0.747	Julius et al., 1983
Selenomethionine	40.26	Rat (*Rattus norvegicus*)	0/10	mg/kg diet	FD	5	weeks	NR	NR	JV	male	BDWT	WO	10		No	0.18	No	1.68E-02	0.375		Dausch and Fullerton, 1993
Sodium selenite	100	Mouse (*Mus musculus*)	0/0.75/1.25/1.75/2.25/3.75/5.0/7.5/10	mg/kg diet	FD	5	weeks	NR	NR	JV	both	BDWT	WO	2.75	3.75	Yes	0.0187	No	2.61E-03	0.384	0.523	Spallholz et al., 1973
Sodium selenite	45.66	Rat (*Rattus norvegicus*)	0/4/8/16	mg/L	DR	240	days	NR	NR	JV	male	BDWT	WO	8	16	Yes	0.550	No	5.78E-02	0.384	0.768	Nebbia et al., 1987
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/5/10/20	mg/kg diet	FD	5	weeks	NR	NR	JV	male	BDWT	WO	5	10	Yes	0.2925	Yes	2.27E-02	0.388	0.776	Kezhou et al., 1987
Sodium selenite	45.66	Rat (*Rattus norvegicus*)	0/0.17/0.28/0.50/0.86/1.67	mg/kg bw/d	DR	13	weeks	6	weeks	JV	female	BDWT	WO	0.86	1.67	Yes	0.188	Yes	9.20E-03	0.393	0.763	Abdo, 1994
sodium selenate	100	Mouse (*Mus musculus*)	0/3	mg/L	DR	360	days	NR	lf	JV	male	BDWT	WO	3		Yes	0.0426	No	5.78E-03	0.407		Schroeder and Mitchener, 1972
Se in food (seleniferous wheat)	100	Rat (*Rattus norvegicus*)	0/1.6/3.2/4.8/6.4/8.0/9.6/11.2	mg/kg diet	FD	6	weeks	NR	NR	JV	male	BDWT	WO	4.8	6.4	Yes	0.239	No	2.12E-02	0.425	0.567	Halverson et al 1966

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Sodium selenite	45.66	Rat (*Rattus norvegicus*)	0/10	mg/kg diet	FD	5	weeks	NR	NR	JV	male	BDWT	WO	10		No	0.18	No	1.68E-02	0.426		Dausch and Fullerton, 1993
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/1.6/3.2/4.8/6.4/8.0/9.6	mg/kg diet	FD	6	weeks	NR	NR	JV	male	BDWT	WO	4.8	6.4	Yes	0.218	No	1.96E-02	0.432	0.577	Halverson et al 1966
L-selenomethionine	100	Rat (*Rattus norvegicus*)	0/2.5/5/10	ug/g diet	FD	6	weeks	21	days	JV	male	BDWT	WO	5	10	No	0.267	No	2.32E-02	0.435	0.869	McAdam and Levander, 1987
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/2.5/5/10	ug/g diet	FD	6	weeks	21	days	JV	male	BDWT	WO	5	10	No	0.267	No	2.32E-02	0.435	0.869	McAdam and Levander, 1987
D-selenomethionine	100	Rat (*Rattus norvegicus*)	0/2.5/5/10	ug/g diet	FD	6	weeks	21	days	JV	male	BDWT	WO	5	10	No	0.267	No	2.32E-02	0.435	0.869	McAdam and Levander, 1987
Sodium selenite	100	Mouse (*Mus musculus*)	0/1/3/9	mg/L	DR	14	days	6-7	weeks	JV	male	BDWT	WO	3	9	Yes	0.02052	No	3.00E-03	0.438	1.31	Johnson, et al., 2000
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/1/4/8/16/64	mg/L	DR	35	days	5, 12	weeks	JV	both	BDWT	WO	4	8	No	0.267	No	3.02E-02	0.452	0.904	Jacobs and Forst 1981
Sodium selenite	100	Pig (*Sus scrofa*)	0/2.63/5.69/8.33	mg/kg diet	FD	17	weeks	NR	NR	JV	both	BDWT	WO	8.33		Yes	40.74	Yes	2.27E+00	0.464		Goehring et al., 1984
Selenomethionine	100	Rat (*Rattus norvegicus*)	0/1/2/4	mg/kg diet	FD	9	weeks	NR	NR	JV	male	BDWT	WO	4		Yes	0.204	Yes	2.50E-02	0.490		Whanger and Butler, 1988
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/1/2/4	mg/kg diet	FD	9	weeks	NR	NR	JV	male	BDWT	WO	4		Yes	0.2	Yes	2.50E-02	0.500		Whanger and Butler, 1988
Selenium sulfide	55.19	Rat (*Rattus norvegicus*)	0/10/30/100/300	mg/kg diet	FD	5	weeks	NR	NR	JV	male	BDWT	WO	10	30	No	0.18	No	1.68E-02	0.515	1.54	Dausch and Fullerton, 1993
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/0.1/0.31/0.61/1.21	mg/kg bw/d	FD	42	days	NR	NR	JV	male	BDWT	WO	0.610	1.21	Yes	0.097	Yes	5.14E-03	0.610	1.21	Beems and van Beek, 1985
Sodium selenite	100	Rabbit (*Oryctolagus cuniculus*)	0/10	mg/kg diet	FD	14	weeks	NR	NR	JV	both	BDWT	WO	10		Yes	1.34	No	8.74E-02	0.652		Turan et al 1997
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/0.68/0.88/1.17	mg/kg bw/d	DR	4	weeks	NR	NR	JV	male	BDWT	WO	0.68	0.88	Yes	0.0919	No	1.16E-02	0.680	0.88	Hadjimarkos, 1970
Sodium selenite	45.66	Mouse (*Mus musculus*)	0/0.26/0.56/0.91/1.61/3.31	mg/kg bw/d	DR	13	weeks	6	weeks	JV	male	BDWT	WO	1.61	3.31	Yes	0.0374	Yes	3.20E-03	0.735	1.51	Abdo, 1994
Sodium selenate	100	Sheep (*Ovis aries*)	0/24	mg/kg diet	FD	88	days	NR	NR	GE	female	BDWT	WO	24		Yes	67	No	2.18E+00	0.780		Panter et al., 1995
Sodium selenate	41.79	Mouse (*Mus musculus*)	0/0.55/1.07/1.87/2.95/5.45	mg/kg bw/d	DR	13	weeks	6	weeks	JV	male	BDWT	WO	1.87	2.95	Yes	16.6922	Yes	3.90E-03	0.781	1.23	Abdo, 1994
Sodium selenite	100	Mouse (*Mus musculus*)	0/10.3/32.3/49.8	ug/org/d	DR	47	weeks	6	weeks	JV	female	BDWT	WO	32.3	49.8	Yes	0.0412	No	5.61E-03	0.784	1.21	Jacobs and Forst, 1981
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/10/20/40/80	mg/kg diet	FD	21	days	4	weeks	JV	both	BDWT	WO	10	20	Yes	0.105	Yes	8.50E-03	0.810	1.62	Julius et al., 1983
Selenium	100	Sheep (*Ovis aries*)	0/29	mg/kg diet	FD	88	days	NR	NR	GE	female	BDWT	WO	29		Yes	66	No	2.15E+00	0.945		Panter et al., 1995
D-selenomethionine	100	Rat (*Rattus norvegicus*)	0/10/16	mg/kg diet	FD	8	weeks	NR	NR	JV	female	BDWT	WO	10	16	No	0.124	No	1.24E-02	0.996	1.59	Hermann, et.al. 1991
L-selenomethionine	100	Rat (*Rattus norvegicus*)	0/10/16	mg/kg diet	FD	8	weeks	NR	NR	JV	female	BDWT	WO	10	16	No	0.124	No	1.24E-02	0.996	1.59	Hermann, et.al. 1991
Sodium selenite	100	Mouse (*Mus musculus*)	0/1/2/4/8	mg/L	DR	12	weeks	5	weeks	JV	male	BDWT	WO	8		Yes	0.03979	No	5.44E-03	1.09		Ishikawa et al., 1992
Sodium selenite	100	Mouse (*Mus musculus*)	0/1/4/8/16/32/64	mg/L	DR	46	days	7	weeks	JV	male	BDWT	WO	8	16	No	0.02695	No	3.83E-03	1.14	2.27	Jacobs and Forst, 1981
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/0.10/0.30/0.63/1.26	mg/kg bw/d	FD	42	days	NR	NR	JV	female	BDWT	WO	1.26		No	0.2425	Yes	6.14E-03	1.26		Beems and van Beek, 1985
Selenomethionine	100	Mouse (*Mus musculus*)	0/0.26/0.63/1.96	mg/kg bw/d	DR	14	days	7-8	weeks	JV	male	BDWT	WO	1.96		Yes	0.0245	No	3.52E-03	1.96		Tsunoda et al., 2000
Sodium selenite	45.66	Rat (*Rattus norvegicus*)	0/2/4	mg/kg diet	FD	1	weeks	NR	NR	JV	male	BDWT	WO		2	Yes	0.125	No	1.24E-02		0.0908	Kaur and Parshad, 1994
Sodium selenite	100	Mouse (*Mus musculus*)	0/0.7/2.8	mg/kg diet	FD	5	weeks	NR	NR	JV	both	BDWT	WO		0.7	Yes	0.0196	No	2.71E-03		0.0968	Spallholz et al., 1973
Sodium selenite	100	Mouse (*Mus musculus*)	0/1.16	ug/g diet	FD	6	month	NR	NR	JV	female	BDWT	WO		1.16	Yes	0.023	No	3.09E-03		0.156	Boylan et al., 1990
Sodium selenite	100	Pig (*Sus scrofa*)	0/7	mg/kg diet	FD	108	days	NR	NR	JV	NR	BDWT	WO		7	Yes	74.39	Yes	1.73E+00		0.163	Wahlstrom et al., 1956
L-Selenomethionine	100	Rat (*Rattus norvegicus*)	0/2	mg/kg diet	FD	110	days	30	days	JV	male	BDWT	WO		2	Yes	0.34	No	2.83E-02		0.166	Behne et al., 1992
Sodium selenite	100	Pig (*Sus scrofa*)	0/12.5	mg/org/d	FD	9	weeks	8-14	weeks	JV	both	BDWT	WO		12.5	No	61	No	2.02E+00		0.205	Baker et al., 1989
Sodium selenite	45.66	Dog (*Canis familiaris*)	0/10	mg/kg diet	FD	8	weeks	150	days	JV	female	BDWT	WO		10	Yes	9.8	No	4.49E-01		0.209	Rhian and Moxon, 1943
Se in food (seleniferous wheat and corn)	100	Rat (*Rattus norvegicus*)	0/2.58/5.6/8.4	mg/kg diet	FD	4	weeks	NR	NR	JV	male	BDWT	WO		2.58	Yes	0.3372	No	2.81E-02		0.215	Goehring et al., 1984
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/2/4/8	mg/L	DR	32	days	NR	NR	JV	male	BDWT	WO		2	Yes	0.208	No	2.41E-02		0.232	Chen et al., 1985
Sodium selenite	100	Pig (*Sus scrofa*)	0/24.5/49/196/392	mg/kg diet	FD	63	days	4	months	JV	both	BDWT	WO		24.5	Yes	31.5	Yes	3.02E-01		0.235	Miller, 1938
Sodium selenite	100	Pig (*Sus scrofa*)	0/10	mg/kg diet	FD	3	month	NR	NR	JV	NR	BDWT	WO		10	Yes	62.2	Yes	1.58E+00		0.254	Wahlstrom et al., 1956
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/2	mg/L	DR	9	days	21	days	JV	both	BDWT	WO		2	Yes	0.05	No	6.68E-03		0.267	Schroeder, 1967
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/2	mg/L	DR	9	days	21	days	JV	both	BDWT	WO		2	Yes	0.037	No	5.09E-03		0.275	Schroeder, 1967
Sodium selenite	100	Mouse (*Mus musculus*)	0/2	mg/L	DR	99	days	21	days	JV	female	BDWT	WO		2	Yes	0.0356	No	5.39E-03		0.276	Schroeder, 1967
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/2.5	mg/L	DR	50	days	23	days	JV	male	BDWT	WO		2.5	No	0.267	No	3.02E-02		0.282	Mercado and Bibby 1973
sodium selenite	100	Pig (*Sus scrofa*)	0/8.1	mg/kg diet	FD	6	weeks	5-6	weeks	JV	male	BDWT	WO		8.1	Yes	30.6	No	1.14E+00		0.303	Wahlstrom et al., 1984
Se in food (*Astragalus bisculatus*)	100	Pig (*Sus scrofa*)	0/18.7	mg/org/d	FD	9	weeks	8-14	weeks	JV	both	BDWT	WO		18.7	No	61	No	2.02E+00		0.307	Baker et al., 1989
Sodium selenite	100	Pig (*Sus scrofa*)	0/11	mg/kg diet	FD	98	days	NR	NR	JV	NR	BDWT	WO		11	Yes	52.75	Yes	1.55E+00		0.323	Wahlstrom et al., 1956
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/5.00/10.0	mg/kg diet	FD	25	weeks	4	weeks	JV	female	BDWT	WO		5	Yes	0.158	Yes	1.09E-02		0.345	Birt et al., 1983
Se in food (*Astragalus praelongus*)	100	Pig (*Sus scrofa*)	0/21.5	mg/org/d	FD	9	weeks	8-14	weeks	JV	both	BDWT	WO		21.5	No	61	No	2.02E+00		0.352	Baker et al., 1989
Sodium selenite pentahydrate	30.02	Rat (*Rattus norvegicus*)	0/10	mg/L	DR	21	days	25	days	JV	female	BDWT	WO		10	Yes	0.0902	No	1.14E-02		0.378	Thorlacius-Ussing et al., 1988
Sodium selenate	41.79	Rat (*Rattus norvegicus*)	0/10/30	mg/kg diet	FD	3	weeks	NR	NR	JV	male	BDWT	WO		10	No	0.18	No	1.68E-02		0.390	Dausch and Fullerton, 1993
Sodium selenite pentahydrate	100	Rat (*Rattus norvegicus*)	0/3	mg/L	DR	21	days	21	days	JV	male	BDWT	WO		3	Yes	0.0385	No	5.28E-03		0.411	Thorlacius-Ussing et al., 1988
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/4.37	mg/kg diet	FD	8	weeks	NR	NR	JV	male	BDWT	WO		4.37	Yes	0.1523	No	1.46E-02		0.420	Liu and Boylan, 1994
sodium selenite	100	Mouse (*Mus musculus*)	0/3	mg/L	DR	90	days	NR	lf	JV	male	BDWT	WO		3	Yes	0.0275	No	3.90E-03		0.425	Schroeder and Mitchener, 1972
Selenocystine	47.27	Rat (*Rattus norvegicus*)	0/10/20	mg/kg diet	FD	5	weeks	NR	NR	JV	male	BDWT	WO		10	No	0.18	No	1.68E-02		0.441	Dausch and Fullerton, 1993
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/15	mg/L	DR	22	weeks	NR	NR	JV	male	BDWT	WO		15	Yes	0.357	Yes	1.08E-02		0.454	Carmichael and Fowler, 1980
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/5	mg/kg diet	FD	10	weeks	4	weeks	JV	male	BDWT	WO		5	Yes	0.136	No	1.33E-02		0.490	Birt et al., 1986
Se in food	100	Pronghorn (*Antilocapra americana*)	0/14	mg/kg diet	FD	164	days	6-96	months	JV	male	BDWT	WO		14	No	63	No	2.07E+00		0.493	Raisbeck et al., 1996
sodium selenate	100	Rat (*Rattus norvegicus*)	0/4/6	mg/L	DR	21	days	21	days	JV	both	BDWT	WO		4	Yes	0.101	No	1.26E-02		0.498	Salbe et al., 1990
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/6	mg/kg diet	FD	6	weeks	NR	NR	JV	male	BDWT	WO		6	No	0.267	No	2.32E-02		0.521	LeBoeuf and Hoekstra, 1983
Sodium selenite	45.66	Rat (*Rattus norvegicus*)	0/10	mg/L	DR	21	days	21	days	JV	both	BDWT	WO		10	No	0.267	No	3.02E-02		0.543	Thorlacius-Ussing, 1990
Selenium	100	Rat (*Rattus norvegicus*)	0/12.5	mg/kg diet	FD	4	weeks	NR	NR	JV	male	BDWT	WO		12.5	Yes	0.1476	Yes	6.50E-03		0.550	Parshad and Sud, 1989
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/3.3	mg/L	DR	14	days	3-4	weeks	JV	male	BDWT	WO		3.3	Yes	0.11	Yes	1.90E-02		0.570	Gronbaek et al., 1995
Sodium selenide	63.2	Rat (*Rattus norvegicus*)	0/10/30/60	mg/kg diet	FD	3	weeks	NR	NR	JV	male	BDWT	WO		10	No	0.18	No	1.68E-02		0.589	Dausch and Fullerton, 1993
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/10/15/20	mg/kg diet	FD	5	weeks	NR	NR	JV	male	BDWT	WO		10	Yes	0.124	Yes	8.10E-03		0.653	Kezhou et al., 1987
Soldium selenite	100	Rat (*Rattus norvegicus*)	0/3	mg/L	DR	21	days	NR	NR	JV	male	BDWT	WO		3	Yes	0.0436	Yes	9.70E-03		0.667	Hadjimarkos, 1967
Se in food (seleniferous corn)	100	Rat (*Rattus norvegicus*)	0/7.8	ug/g diet	FD	4	weeks	NR	NR	JV	male	BDWT	WO		7.8	Yes	0.21596	No	1.95E-02		0.704	Palmer et al 1983
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/8.0	ug/g diet	FD	4	weeks	NR	NR	JV	male	BDWT	WO		8	Yes	0.16976	No	1.60E-02		0.754	Palmer et al 1983
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/3.09/6.01/9.01	mg/L	DR	7	days	21	days	JV	male	BDWT	WO		3.09	Yes	0.065	Yes	9.57E-03		0.767	Palmer and Olson, 1974
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/10	mg/L	DR	13	weeks	50	days	JV	male	BDWT	WO		10	Yes	0.523	No	4.02E-02		0.769	Cabe, et al., 1979
Sodium (plant form)	100	Pig (*Sus scrofa*)	0/25	mg/org/d	FD	6	weeks	8-10	weeks	JV	both	BDWT	WO		25	No	31.5	No	1.17E+00		0.794	Panter et al., 1996
Seleno-dl-methionine	100	Pig (*Sus scrofa*)	0/25	mg/org/d	FD	6	weeks	8-10	weeks	JV	both	BDWT	WO		25	No	31.5	No	1.17E+00		0.794	Panter et al., 1996
Selenomethionine	100	Rat (*Rattus norvegicus*)	0/8.27	mg/kg diet	FD	4	weeks	NR	NR	JV	NR	BDWT	WO		8.27	Yes	0.153	No	1.47E-02		0.794	Palmer et al., 1982
Sodium selenate	100	Pig (*Sus scrofa*)	0/25	mg/org/d	FD	6	weeks	8-10	weeks	JV	both	BDWT	WO		25	No	31.5	No	1.17E+00		0.794	Panter et al., 1996
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/8.22	mg/kg diet	FD	4	weeks	NR	NR	JV	NR	BDWT	WO		8.22	Yes	0.133	No	1.31E-02		0.809	Palmer et al., 1982
Se in food (seleniferous corn)	100	Rat (*Rattus norvegicus*)	0/8.28	mg/kg diet	FD	4	weeks	NR	NR	JV	NR	BDWT	WO		8.28	Yes	0.131	No	1.29E-02		0.817	Palmer et al., 1982
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/10	ug/g diet	FD	8	weeks	NR	NR	JV	male	BDWT	WO		10	Yes	0.3624	No	2.98E-02		0.823	Palmer et al 1983

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/9	mg/kg diet	FD	4	weeks	NR	NR	JV	NR	BDWT	WO		9	Yes	0.1188	No	1.19E-02		0.903	Obermeyer et al., 1971
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/10	mg/kg diet	FD	28	days	NR	NR	JV	male	BDWT	WO		10	Yes	0.146	No	1.41E-02		0.968	Halverson and Monty, 1960
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/10	mg/kg diet	FD	18	days	NR	NR	NR	male	BDWT	WO		10	Yes	0.133	No	1.31E-02		0.984	Halverson et al., 1962
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/10	mg/kg diet	FD	28	days	NR	NR	JV	male	BDWT	WO		10	Yes	0.13	No	1.28E-02		0.988	Halverson and Monty, 1960
Potassium selenate	100	Rat (*Rattus norvegicus*)	0/10	mg/kg diet	FD	18	days	NR	NR	NR	male	BDWT	WO		10	Yes	0.1402	No	1.37E-02		1.02	Halverson et al., 1962
Sodium selenate	41.79	Rat (*Rattus norvegicus*)	0/24	mg/L	DR	5	month	NR	NR	JV	male	BDWT	WO		24	Yes	0.321	No	3.56E-02		1.11	Cutler, 1974
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/16	mg/kg diet	FD	8	weeks	NR	NR	JV	female	BDWT	WO		16	No	0.124	No	1.24E-02		1.59	Hermann, et.al. 1991
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/92.14	ug/org/d	DR	1	weeks	1	months	JV	both	BDWT	WO		92.14	Yes	0.039	No	7.63E-03		1.59	Rastogi et al., 1976
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/1.79	mg/kg bw/d	FD	65	days	28	days	JV	both	BDWT	WO		1.79	Yes	0.063	Yes	4.26E-03		1.79	Franke and Moxon 1937
Selenium	100	Rat (*Rattus norvegicus*)	0/20	mg/kg diet	FD	18	days	NR	NR	NR	male	BDWT	WO		20	Yes	0.1456	No	1.41E-02		1.94	Halverson et al., 1962
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/3.54	mg/kg bw/d	FD	5	days	28	days	JV	male	BDWT	WO		3.54	Yes	0.035	Yes	2.50E-03		3.54	Franke and Moxon 1937
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/50	mg/kg diet	FD	5	days	28	days	JV	both	BDWT	WO		50	Yes	0.029	Yes	2.17E-03		3.74	Franke and Moxon 1937
Survival																						
Sodium selenite	100	Mouse (*Mus musculus*)	0/0.7/2.8	mg/kg diet	FD	5	weeks	NR	NR	JV	both	SURV	WO	0.7	2.8	Yes	0.0204	No	2.80E-03	0.0961	0.385	Spallholz et al., 1973
Sodium selenite	100	Mouse (*Mus musculus*)	0/0.75/1.25/1.75/2.25/3.75/5.0/7.5/10	mg/kg diet	FD	5	weeks	NR	NR	JV	both	SURV	WO	0.75	1.25	Yes	0.0227	No	3.06E-03	0.101	0.168	Spallholz et al., 1973
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/2.09/3.01	mg/L	DR	42	days	21	days	JV	male	MORT	WO	3.01		Yes	0.248	Yes	1.50E-02	0.181		Palmer and Olson, 1974
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/2.11/2.99	mg/L	DR	42	days	21	days	JV	male	MORT	WO	2.99		Yes	0.26	Yes	1.66E-02	0.186		Palmer and Olson, 1974
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/2.5/5/10	ug/g diet	FD	6	weeks	21	days	JV	male	MORT	WO	2.5	5	No	0.267	No	2.32E-02	0.217	0.435	McAdam and Levander, 1987
L-selenomethionine	100	Rat (*Rattus norvegicus*)	0/2.5/5/10	ug/g diet	FD	6	weeks	21	days	JV	male	MORT	WO	2.5	5	No	0.267	No	2.32E-02	0.217	0.435	McAdam and Levander, 1987
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/2	mg/L	DR	180	days	21	days	JV	both	MORT	WO	2		Yes	0.338	No	3.73E-02	0.221		Schroeder, 1967
L-selenomethionine	100	Rat (*Rattus norvegicus*)	0/0.75/1.5/2.25	mg/L	DR	2	weeks	NR	NR	NR	male	SURV	WO	2.25		No	0.5	No	5.31E-02	0.239		Gronbaek and Thorlacius-Ussing 1990
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/3.09/6.08/8.87	mg/L	DR	21	days	21	days	JV	male	MORT	WO	3.09	6.08	Yes	0.19	Yes	1.69E-02	0.274	0.540	Palmer and Olson, 1974
Sodium selenate	100	Cattle (*Bos taurus*)	0/1.0/3.0/5.0/10.0	mg/kg diet	FD	6	weeks	3	days	JV	male	MORT	WO	10		Yes	57.72	No	1.93E+00	0.334		Jenkins and Hidiroglou, 1986
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/5.00	mg/kg diet	FD	25	weeks	4	weeks	JV	both	MORT	WO	5		Yes	0.177	Yes	1.24E-02	0.350		Birt et al., 1983
Selenomethionine	40.26	Rat (*Rattus norvegicus*)	0/10	mg/kg diet	FD	3	weeks	NR	NR	JV	male	SURV	WO	10		No	0.18	No	1.68E-02	0.375		Dausch and Fullerton, 1993
Sodium selenite	45.66	Rat (*Rattus norvegicus*)	0/0.17/0.28/0.50/0.86/1.67	mg/kg bw/d	DR	13	weeks	6	weeks	JV	female	MORT	WO	0.86	1.67	Yes	0.188	Yes	9.20E-03	0.393	0.763	Abdo, 1994
Sodium selenite	45.66	Rat (*Rattus norvegicus*)	0/10/30/100	mg/kg diet	FD	3	weeks	NR	NR	JV	male	MORT	WO	10	30	No	0.18	No	1.68E-02	0.426	1.28	Dausch and Fullerton, 1993
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/2.5/5/10	ug/g diet	FD	6	weeks	21	days	JV	male	MORT	WO	5	10	No	0.267	No	2.32E-02	0.435	0.869	McAdam and Levander, 1987
D-selenomethionine	100	Rat (*Rattus norvegicus*)	0/2.5/5/10	ug/g diet	FD	6	weeks	21	days	JV	male	MORT	WO	5	10	No	0.267	No	2.32E-02	0.435	0.869	McAdam and Levander, 1987
sodium selenite	100	Pig (*Sus scrofa*)	0/2.5/5.0/7.5/10/15/20/40	mg/kg diet	FD	37	days	NR	NR	JV	NR	MORT	WO	15	20	Yes	11.21	Yes	3.54E-01	0.474	0.632	Moxon and Mahan, 1982
Sodium selenate	41.79	Rat (*Rattus norvegicus*)	0/0.31/0.47/0.88/1.35/1.84	mg/kg bw/d	DR	13	weeks	6	weeks	JV	female	MORT	WO	1.35	1.84	Yes	0.141	Yes	6.40E-02	0.564	0.769	Abdo, 1994
Se in food (seleniferous wheat)	100	Rat (*Rattus norvegicus*)	0/1.6/3.2/4.8/6.4/8.0/9.6/11.2	mg/kg diet	FD	4	weeks	NR	NR	JV	male	MORT	WO	6.4	8	Yes	0.22	No	1.98E-02	0.576	0.720	Halverson et al 1966
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/1.6/3.2/4.8/6.4/8.0/9.6	mg/kg diet	FD	4	weeks	NR	NR	JV	male	MORT	WO	6.4	8	Yes	0.198	No	1.82E-02	0.587	0.733	Halverson et al 1966
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/3.09/6.01/9.01	mg/L	DR	21	days	21	days	JV	male	MORT	WO	6.01	9.01	Yes	0.1	Yes	9.90E-03	0.595	0.892	Palmer and Olson, 1974
Sodium selenite	45.66	Pig (*Sus scrofa*)	0/1.4/2.6/4.2	mg/kg bw/d	OR	9	days	6	weeks	JV	male	MORT	WO	1.4	2.6	Yes	9.3	No	4.30E-01	0.639	1.19	Wilson et al 1988
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/5.00/10.0	mg/kg diet	FD	25	weeks	4	weeks	JV	both	MORT	WO	10		Yes	0.158	Yes	1.03E-02	0.652		Birt et al., 1983
Sodium selenite	100	Rabbit (*Oryctolagus cuniculus*)	0/10	mg/kg diet	FD	14	weeks	NR	NR	JV	both	MORT	WO	10		Yes	1.34	No	8.74E-02	0.652		Turan et al 1997
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/10/15/20	mg/kg diet	FD	22	days	NR	NR	JV	male	MORT	WO	10	15	Yes	0.124	Yes	8.10E-03	0.653	0.980	Kezhou et al., 1987
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/2/6	mg/kg diet	FD	4	weeks	NR	NR	JV	male	MORT	WO	6		Yes	0.06	No	6.80E-03	0.680		Chen et al., 1982
Se in food (seleniferous corn)	100	Rat (*Rattus norvegicus*)	0/7.8	ug/g diet	FD	4	weeks	NR	NR	JV	male	MORT	WO	7.8		Yes	0.21596	No	1.95E-02	0.704		Palmer et al 1983
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/8.0	ug/g diet	FD	4	weeks	NR	NR	JV	male	MORT	WO	8		Yes	0.16976	No	1.60E-02	0.754		Palmer et al 1983
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/10	mg/L	DR	18	weeks	50	days	JV	male	MORT	WO	10		Yes	0.523	No	4.02E-02	0.769		Cabe, et al., 1979
Selenomethionine	100	Rat (*Rattus norvegicus*)	0/8.27	mg/kg diet	FD	4	weeks	NR	NR	JV	NR	MORT	WO	8.27		Yes	0.153	No	1.47E-02	0.794		Palmer et al., 1982
Selenium	100	Rat (*Rattus norvegicus*)	0/0.94/85.6	mg/kg diet	FD	4	weeks	NR	NR	JV	NR	MORT	WO	8.56		Yes	0.155	No	1.48E-02	0.820		Palmer et al., 1982
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/5/10/20	mg/kg diet	FD	22	days	NR	NR	JV	male	MORT	WO	10	20	Yes	0.1576	Yes	1.35E-02	0.857	1.71	Kezhou et al., 1987
Selenocystine	47.27	Rat (*Rattus norvegicus*)	0/10/20	mg/kg diet	FD	3	weeks	NR	NR	JV	male	SURV	WO	20		No	0.18	No	1.68E-02	0.881		Dausch and Fullerton, 1993
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/1/4/8/16/64	mg/L	DR	35	days	5, 12	weeks	JV	both	SURV	WO	8	16	No	0.267	No	3.02E-02	0.904	1.81	Jacobs and Forst 1981
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/128.6	ug/org/d	DR	8	weeks	1	months	JV	both	MORT	WO	128.6		Yes	0.135	No	1.63E-02	0.953		Rastogi et al., 1976
Sodium selenate	41.79	Rat (*Rattus norvegicus*)	0/10/30	mg/kg diet	FD	3	weeks	NR	NR	JV	male	MORT	WO	30		No	0.18	No	1.68E-02	1.17		Dausch and Fullerton, 1993
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/0.68/0.88/1.17	mg/kg bw/d	DR	4	weeks	NR	NR	JV	male	MORT	WO	1.17		Yes	0.0834	No	1.06E-02	1.17		Hadjimarkos, 1970
Sodium selenite	100	Mouse (*Mus musculus*)	0/10.3/32.3/49.8	ug/org/d	DR	47	weeks	6	weeks	JV	female	MORT	WO	49.8		Yes	0.0412	No	5.61E-03	1.21		Jacobs and Forst, 1981
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/0.1/0.31/0.61/1.21	mg/kg bw/d	FD	42	days	NR	NR	JV	male	MORT	WO	1.21		No	0.097	Yes	5.00E-03	1.21		Beems and van Beek, 1985
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/0.10/0.30/0.63/1.26	mg/kg bw/d	FD	42	days	NR	NR	JV	female	MORT	WO	1.26		Yes	0.2425	Yes	6.14E-03	1.26		Beems and van Beek, 1985
Sodium selenite	100	Pig (*Sus scrofa*)	0/24.5/49/196/392	mg/kg diet	FD	63	days	4	months	JV	both	MORT	WO	49	196	Yes	10.43	Yes	3.17E-01	1.49	5.96	Miller, 1938
Sodium selenite	45.66	Mouse (*Mus musculus*)	0/0.26/0.56/0.91/1.61/3.31	mg/kg bw/d	DR	13	weeks	6	weeks	JV	male	MORT	WO	3.31		Yes	0.0338	Yes	4.70E-03	1.51		Abdo, 1994
Sodium selenite	100	Mouse (*Mus musculus*)	0/1/4/8/16/32/64	mg/L	DR	46	days	7	weeks	JV	both	MORT	WO	16	32	No	0.02695	No	3.83E-03	2.27	4.55	Jacobs and Forst, 1981
Sodium selenate	41.79	Mouse (*Mus musculus*)	0/0.55/1.07/1.87/2.95/5.45	mg/kg bw/d	DR	13	weeks	6	weeks	JV	both	MORT	WO	5.45		Yes	0.0302	Yes	2.50E-03	2.28		Abdo, 1994
sodium selenite	100	Goat (*Capra hircus*)	0/3/6/10	mg/kg bw	OR	17	days	6	months	MA	NR	MORT	WO	3	6	Yes	9	No	4.18E-01	3.0	6.0	Pathak and Datta 1984
Sodium selenite	100	Hamster (*Mesocricetus auratus*)	0/10/20/40/80	mg/kg diet	FD	21	days	4	weeks	JV	both	MORT	WO	40	80	Yes	0.078	Yes	6.20E-03	3.18	6.36	Julius et al., 1983
Sodium selenide	63.2	Rat (*Rattus norvegicus*)	0/10/30/60	mg/kg diet	FD	3	weeks	NR	NR	JV	male	SURV	WO	60		No	0.18	No	1.68E-02	3.53		Dausch and Fullerton, 1993
Selenium sulfide	55.19	Rat (*Rattus norvegicus*)	0/10/30/100/300	mg/kg diet	FD	3	weeks	NR	NR	JV	male	SURV	WO	300		No	0.18	No	1.68E-02	15.4		Dausch and Fullerton, 1993
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/2	mg/L	DR	16	days	21	days	JV	both	MORT	WO		2	Yes	0.037	No	5.09E-03		0.275	Schroeder, 1967
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/4	mg/L	DR	10	weeks	5	weeks	JV	male	SURV	WO		4	Yes	0.35	No	3.85E-02		0.440	Jacobs and Forst 1981
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/8.22	mg/kg diet	FD	4	weeks	NR	NR	JV	NR	MORT	WO		8.22	Yes	0.133	No	1.31E-02		0.809	Palmer et al., 1982
Se in food (seleniferous corn)	100	Rat (*Rattus norvegicus*)	0/8.28	mg/kg diet	FD	4	weeks	NR	NR	JV	NR	MORT	WO		8.28	Yes	0.131	No	1.29E-02		0.817	Palmer et al., 1982
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/10	ug/g diet	FD	8	weeks	NR	NR	JV	male	SURV	WO		10	Yes	0.3624	No	2.98E-02		0.823	Palmer et al 1983
Potassium selenate	100	Rat (*Rattus norvegicus*)	0/10	mg/kg diet	FD	18	days	NR	NR	NR	male	MORT	WO		10	Yes	0.1402	No	1.37E-02		0.975	Halverson et al., 1962
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/10	mg/kg diet	FD	18	days	NR	NR	NR	male	MORT	WO		10	Yes	0.133	No	1.31E-02		0.984	Halverson et al., 1962
Sodium selenate	41.79	Rat (*Rattus norvegicus*)	0/24	mg/L	DR	5	month	NR	NR	JV	male	MORT	WO		24	Yes	0.321	No	3.56E-02		1.11	Cutler, 1974
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/1.79	mg/kg bw/d	FD	100	days	28	days	JV	male	MORT	WO		1.79	Yes	0.063	Yes	4.26E-03		1.79	Franke and Moxon 1937
Selenium	100	Rat (*Rattus norvegicus*)	0/20	mg/kg diet	FD	18	days	NR	NR	NR	male	MORT	WO		20	Yes	0.1456	No	1.41E-02		1.94	Halverson et al., 1962
Sodium selenite	100	Rat (*Rattus norvegicus*)	0/3.54	mg/kg bw/d	FD	100	days	28	days	JV	both	MORT	WO		3.54	Yes	0.035	Yes	2.50E-03		3.54	Franke and Moxon 1937
Sodium selenate	100	Rat (*Rattus norvegicus*)	0/50	mg/kg diet	FD	100	days	28	days	JV	both	MORT	WO		50	Yes	0.029	Yes	2.17E-03		3.74	Franke and Moxon 1937
Sodium selenite	100	Pig (*Sus scrofa*)	0/121.7	mg/kg diet	FD	19	days	NR	NR	NR	both	MORT	WO		121.7	Yes	49.5	No	1.70E+00		4.17	Davidson-York et al., 1999

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Silver																						
Reproduction																						
Silver chloride	75.2	Rat (*Rattus norvegicus*)	0/50	mg/org/d	FD	20	days	NR	NR	GE	female	PROG	WO		50	Yes	0.2	No	1.83E-02		188	Shavlovski et al., 1995

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Growth																						
Silver acetate	64.63	Pig (*Sus scrofa*)	0/0.2	% in diet	FD	40	days	NR	NR	JV	NR	BDWT	WO		0.2	Yes	8.86	No	4.13E-01		60.2	Van Vleet, 1976
Silver acetate	100	Rat (*Rattus norvegicus*)	0/751	mg/L	DR	15	weeks	21	days	JV	both	BDWT	WO		751	No	0.4702	No	5.02E-02		80.2	Wagner et al., 1975
Silver acetate	100	Pig (*Sus scrofa*)	0/3000	mg/kg diet	FD	4	weeks	NR	NR	JV	male	BDWT	WO		3000	Yes	15.8	No	6.64E-01		126	Van Vleet et al., 1981
Silver acetate	64.63	Pig (*Sus scrofa*)	0/0.5	% in diet	FD	28	days	NR	NR	JV	NR	BDWT	WO		0.5	Yes	13.52	No	5.84E-01		140	Van Vleet, 1976
Silver nitrate	63.5	Rat (*Rattus norvegicus*)	0/0.25	% in diet	DR	16	weeks	NR	NR	JV	male	BDWT	WO		0.25	Yes	0.365	No	4.00E-02		174	Matuk et al., 1981
Survival																						
Silver acetate	64.63	Pig (*Sus scrofa*)	0/0.2	% in diet	FD	40	days	NR	NR	JV	NR	MORT	WO	0.2		Yes	8.86	No	4.13E-01	60.2		Van Vleet, 1976
Silver nitrate	100	Rat (*Rattus norvegicus*)	0/1000	mg/L	DR	13	weeks	50	days	JV	male	MORT	WO	1000		Yes	0.2	No	2.33E-02	116		Cabe, et al., 1979
Silver acetate	100	Pig (*Sus scrofa*)	0/3000	mg/kg diet	FD	25	days	NR	NR	JV	male	MORT	WO		3000	Yes	16.4	No	6.85E-01		125	Van Vleet et al., 1981
Silver acetate	64.63	Pig (*Sus scrofa*)	0/0.5	% in diet	FD	28	days	NR	NR	JV	NR	MORT	WO		0.5	Yes	13.52	No	5.84E-01		140	Van Vleet, 1976
Strontium																						
Growth																						
Strontium chloride	55.00	Rat (*Rattus norvegicus*)	70/147/263	mg/kg/d	DR	3	years	NR	NR	NR	NR	BDWT	WO	263		yes	0.35	No	NR	263		Skoryna, 1981
Thallium																						
Reproduction																						
Thallium sulfate		Rat (*Rattus norvegicus*)	0.74	mgkg/d	DR	60	days	NR	NR	AD	male	TEDG	SM		0.7	yes	0.37	no	NR	0.0074	0	Formigli et al, 1986
Vanadium																						
Reproduction																						
Sodium metavanadate	43.55	Rat (*Rattus norvegicus*)	0/5/10/20	mg/kg bw/d	OR	36	days	NR	NR	GE	female	PRWT	WO		5.0	Yes	0.28	No	2.41E-02		2.18	Domingo et al., 1986
Sodium metavanadate	100	Rat (*Rattus norvegicus*)	0/75	ug/g diet	FD	3	weeks	NR	NR	GE	female	PROG	WO		75	Yes	0.334	No	2.79E-02		6.26	Elfant and Keen, 1987
Sodium orthovanadate	100	Rat (*Rattus norvegicus*)	0/0.25	mg/ml	DR	10	days	NR	NR	GE	female	PROG	WO		0.250	Yes	0.23	No	2.64E-02		28.7	Ganguli et al., 1994
Growth																						
Vanadium pentoxide	100	Rat (*Rattus norvegicus*)	0/0.2/100	mg/L	DR	8	weeks	21	days	JV	male	BDWT	WO	0.20	100	Yes	0.35	No	3.85E-02	0.0220	11.0	Mravcova et al., 1989
Vanadyl Sulfate	100	Rat (*Rattus norvegicus*)	0/5	mg/L	DR	519	days	21	days	JV	both	BDWT	WO	5.0		Yes	0.4728	No	5.04E-02	0.534		Schroeder et al., 1970
Vanadyl sulfate	100	Mouse (*Mus musculus*)	0/5	mg/L	DR	520	days	19-20	days	JV	male	BDWT	WO	5.0		Yes	0.0455	No	6.14E-03	0.674		Schroeder and Mitchener, 1975
Sodium metavanadate	100	Rat (*Rattus norvegicus*)	0/0.444/1.03/5.11/9.78/19.0	mg/kg bw/d	FD	10	weeks	3-4	weeks	JV	both	BDWT	WO	1.03	5.11	Yes	0.242	Yes	2.14E-02	1.03	5.11	Daniel and Lillie, 1938
Sodium metavanadate	100	Rat (*Rattus norvegicus*)	0/5/25	mg/kg diet	FD	2	weeks	NR	NR	JV	female	BDWT	WO	25.0		Yes	0.233	No	2.07E-02	2.23		Bogden et al., 1982
Sodium metavanadate	100	Rat (*Rattus norvegicus*)	0/5/10/50	mg/L	DR	3	month	NR	NR	JV	male	BDWT	WO	50.0		Yes	0.5416	Yes	4.16E-02	3.84		Domingo et al., 1985
Ammonium metavanadate	100	Rat (*Rattus norvegicus*)	0/1.18/4.93	mg/kg bw/d	DR	4	weeks	2	months	JV	male	BDWT	WO	4.93		Yes	0.25785	Yes	1.76E-05	4.93		Zaporowska et al., 1993
Ammonium metavanadate	100	Sheep (*Ovis aries*)	0/50/200	mg/kg diet	FD	90	days	NR	NR	JV	male	BDWT	WO	200		Yes	51.28	Yes	1.40E+00	5.46		Hansard et al., 1982
Ammonium vanadate	100	Sheep (*Ovis aries*)	0/10/100/200	mg/kg diet	FD	84	days	NR	NR	JV	male	BDWT	WO	200		Yes	54.5	Yes	1.55E+00	5.69		Hansard, et al., 1978
Ammonium vanadate	100	Sheep (*Ovis aries*)	0/10/100/200	mg/kg diet	FD	84	days	NR	NR	JV	male	BDWT	WO	200		Yes	54.5	Yes	1.55E+00	5.69		Hansard, et al., 1978
Sodium metavanadate	100	Rat (*Rattus norvegicus*)	0/7060	ug/kg bw/d	FD	1	weeks	6	weeks	JV	female	BDWT	WO	7060		Yes	0.145	Yes	1.05E-02	7.06		Adachi et al., 2000
Vanadyl sulfate hydrate	100	Rat (*Rattus norvegicus*)	0/7.64	mg/kg bw/d	DR	12	weeks	NR	NR	JV	female	BDWT	WO	7.64		Yes	0.55	No	5.78E-02	7.64		Dai et al., 1995
Ammonium metavanadate	100	Rat (*Rattus norvegicus*)	0/9.68	mg/kg bw/d	DR	12	weeks	NR	NR	JV	male	BDWT	WO	9.68		Yes	0.52	No	5.50E-02	9.68		Dai et al., 1995
Ammonium vanadate	43.55	Rat (*Rattus norvegicus*)	0/300	mg/kg diet	FD	2	month	NR	NR	JV	male	BDWT	WO	300		Yes	0.358	No	2.95E-02	10.8		Susic and Kentera, 1986
Vanadyl sulfate pentahydrate	20.14	Rat (*Rattus norvegicus*)	0/0.75	mg/ml	DR	6	month	NR	NR	JV	male	BDWT	WO	0.75		Yes	0.4196	Yes	3.21E-02	11.6		Cadene et al., 1996
Sodium metavanadate	100	Rat (*Rattus norvegicus*)	0/24	mg/kg bw/d	DR	3	weeks	NR	NR	JV	male	BDWT	WO	24		Yes	0.2714	Yes	3.26E-02	24		Meryervitch et al. 1987
Sodium vanadate	100	Rat (*Rattus norvegicus*)	0/5/47	mg/org/d	FD	24	weeks	3-3.5	months	JV	male	BDWT	WO	47.0		Yes	0.345	No	2.86E-02	136		Susic and Kentera, 1987
Sodium metavanadate	100	Rat (*Rattus norvegicus*)	0/4612/21695	mg/kg bw/d	FD	2	weeks	NR	NR	JV	female	BDWT	WO	21695		Yes	0.2349	No	2.09E-02	21695		Higashino et al., 1983
Sodium metavanadate	100	Rat (*Rattus norvegicus*)	0/1.88	mg/kg bw/d	FD	100	days	28	days	JV	both	BDWT	WO		1.88	Yes	0.2528	Yes	1.05E-02		1.88	Franke and Moxon 1937
Sodium vanadate	100	Rat (*Rattus norvegicus*)	0/3.58	mg/kg bw/d	FD	100	days	28	days	JV	both	BDWT	WO		3.58	Yes	0.151	Yes	7.75E-03		3.58	Franke and Moxon 1937
Sodium metavanadate	100	Rat (*Rattus norvegicus*)	0/75	ug/g diet	FD	3	weeks	NR	NR	GE	female	BDWT	WO		75	Yes	0.334	No	2.79E-02		6.26	Elfant and Keen, 1987
Sodium orthovanadate	27.7	Rat (*Rattus norvegicus*)	0/5	mg/org/d	DR	14	days	NR	NR	JV	male	BDWT	WO		5.0	Yes	0.2032	No	2.36E-02		6.82	Challiss et al., 1987
Ammonium metavanadate	100	Pig (*Sus scrofa*)	0/200	mg/kg diet	FD	3	weeks	NR	NR	JV	male	BDWT	WO		200	No	10.6	No	4.78E-01		9.03	Van Vleet et al., 1981
Ammonium metavanadate	100	Rat (*Rattus norvegicus*)	0/11.6	mg/kg bw/d	DR	4	weeks	2	months	JV	male	BDWT	WO		11.6	Yes	0.260	Yes	1.96E-02		11.6	Zaporowska and Scibior, 1999
Vanadyl sulfate	25.59	Rat (*Rattus norvegicus*)	0/0.75	mg/ml	DR	3	weeks	6	weeks	JV	male	BDWT	WO		0.750	Yes	0.334	No	3.69E-02		21.2	Bhanot et al., 1994
Vanadium Pentoxide	100	Rat (*Rattus norvegicus*)	0/10.33/18.88	mg/org/d	FD	76	days	NR	NR	JV	male	BDWT	WO		10.3	Yes	0.392	Yes	1.83E-02		26.4	Mountain et al., 1953
Ammonium metavanadate	100	Rat (*Rattus norvegicus*)	0/29	mg/kg bw/d	DR	8	weeks	2	months	JV	male	BDWT	WO		29.0	Yes	0.270	Yes	1.39E-05		29.0	Zaporowska and Wasilewski, 1989
Vanadyl sulfate trihydrate	100	Rat (*Rattus norvegicus*)	0/1	mg/ml	DR	10	weeks	NR	NR	JV	male	BDWT	WO		1.0	Yes	0.413	No	4.47E-02		108	Ramanadham et al., 1989
Survival																						
Vanadyl sulfate	100	Mouse (*Mus musculus*)	0/5	mg/L	DR	520	days	19-20	days	JV	male	LFSP	WO	5.0		Yes	0.031	No	4.34E-03	0.701		Schroeder and Mitchener, 1975
Sodium metavanadate	100	Rat (*Rattus norvegicus*)	0/0.444/1.03/5.11/9.78/19.0	mg/kg bw/d	FD	10	weeks	3-4	weeks	JV	both	MORT	WO	9.6	17.9	Yes	0.157	Yes	1.50E-02	9.6	17.9	Daniel and Lillie, 1938
Vanadyl sulfate pentahydrate	20.14	Rat (*Rattus norvegicus*)	0/0.75	mg/ml	DR	6	month	NR	NR	JV	male	MORT	WO	0.75		Yes	0.4196	Yes	3.21E-02	11.6		Cadene et al., 1996
Metavanadate	100	Rabbit (*Oryctolagus cuniculus*)	0/20	mg/L	DR	171	days	NR	NR	AD	NR	SURV	WO		20.0	Yes	1.259	No	1.22E-01		1.93	Kasibhatla and Rai, 1993
Ammonium metavanadate	100	Pig (*Sus scrofa*)	0/200	mg/kg diet	FD	10	weeks	NR	NR	JV	male	MORT	WO		200	No	16.6	No	6.92E-01		8.33	Van Vleet et al., 1981
Ammonium metavanadate	100	Rat (*Rattus norvegicus*)	0/29	mg/kg bw/d	DR	4	weeks	2	months	JV	male	MORT	WO		29.0	Yes	0.270	Yes	1.51E-05		29.0	Zaporowska and Wasilewski, 1989
Zinc																						
Reproduction																						
Zinc oxide	100	Pig (*Sus scrofa*)	0/500/5000	mg/kg diet	FD	12	month	7-8	months	GE	female	ODVP	WO	500	5000	Yes	167	Yes	2.75E+00	8.23	82.3	Hill et. al., 1983
Zinc acetate	100	Rat (*Rattus norvegicus*)	0/150	mg/kg diet	FD	5	weeks	NR	NR	JV	male	ORWT	TE	150		Yes	0.126	Yes	8.10E-03	9.64		Alaoui et al., 1985
Zinc carbonate	100	Rat (*Rattus norvegicus*)	0/120	mg/kg diet	FD	37	days	105	days	LC	female	PRWT	WO	120		Yes	0.3742	Yes	4.50E-02	14.4		Cerklewski, 1979
Zinc acetate	100	Rat (*Rattus norvegicus*)	0/34	mg/kg bw/d	FD	4	days	NR	NR	GE	female	PRWT	WO	34		Yes	0.275	No	2.38E-02	34.0		Khera and Shah, 1979
Zinc sulfate	100	Cattle (*Bos taurus*)	0/1000/2000	mg/kg diet	FD	14	weeks	NR	NR	LC	female	PRWT	WO	1000	2000	Yes	580	Yes	2.20E+01	37.9	75.9	Miller et al., 1989
zinc (unspecified)	100	Rat (*Rattus norvegicus*)	0/1000	ug/g	FD	21	days	NR	NR	GE	female	PRWT	WO	1000		Yes	0.34	Yes	1.40E-02	41.2		Amemiya et al., 1986
Zinc chloride	100	Rat (*Rattus norvegicus*)	0/500	mg/kg diet	FD	8	weeks	3	weeks	JV	male	TEWT	TE	500		Yes	0.319	No	2.69E-02	42.1		Evenson et al., 1993
Zinc (unspecified)	100	Rat (*Rattus norvegicus*)	0/1000	mg/kg diet	FD	21	days	NR	NR	GE	female	PRWT	WO	1000		Yes	0.225	No	2.02E-02	89.6		Shrader et al., 1978
Zinc carbonate	100	Rat (*Rattus norvegicus*)	0/1000	mg/kg diet	FD	12	days	NR	NR	GE	female	PRWT	WO	1000		Yes	0.225	No	2.02E-02	89.6		Hirsch and Hurley, 1978
Zinc oxide	100	Pig (*Sus scrofa*)	0/500/5000	mg/kg diet	FD	20	weeks	NR	NR	LC	female	RHIS	WO	5000		Yes	140.6	Yes	2.75E+00	97.8		Hill et al., 1983
Zinc chloride	100	Mouse (*Mus musculus*)	0/200/400/800	mg/kg diet	FD	19	days	4	months	GE	female	PRWT	WO	800		Yes	0.032	No	4.06E-03	101		Webster, 1979
Zinc chloride	100	Mouse (*Mus musculus*)	0/110.2	mg/kg bw/d	FD	13	weeks	12	weeks	JV	male	PRWT	WO	110.2		Yes	0.000042	No	1.91E-05	110		Anderson et al., 1993
Zinc oxide	100	Rat (*Rattus norvegicus*)	0/0.2	% in diet	FD	36	days	NR	NR	GE	female	PRWT	WO	0.2		No	0.338	No	2.82E-02	167		Schlicker and Cox, 1968
Zinc oxide	100	Rat (*Rattus norvegicus*)	0/0.2/0.5	% in diet	FD	14	days	NR	NR	LC	female	PRWT	WO	0.2	0.5	Yes	0.262	Yes	2.37E-02	181	452	Ketcheson et al., 1969

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Zinc sulfate heptahydrate	100	Rat (*Rattus norvegicus*)	0/23.2/234/2514	mg/kg bw/d	FD	13	weeks	5	weeks	JV	male	ORWT	TE	234	2514	Yes	0.43	Yes	2.36E-02	234	2514	Maita et al., 1981
Zinc oxide	100	Rat (*Rattus norvegicus*)	0/0.4	% in diet	FD	21	days	NR	NR	LC	female	GREP	WO	0.4		Yes	0.268	No	2.33E-02	347		Chu and Cox, 1970
Zinc sulfate heptahydrate	100	Mouse (*Mus musculus*)	0/42.7/458/4927	mg/kg bw/d	FD	13	weeks	5	weeks	JV	male	ORWT	TE	458	4927	Yes	0.0453	Yes	6.00E-03	458	4927	Maita et al., 1981
Zinc sulfate heptahydrate	100	Mouse (*Mus musculus*)	0/46.4/479/4878	mg/kg bw/d	FD	13	weeks	5	weeks	JV	female	ORWT	OV	479	4878	Yes	0.0446	Yes	5.20E-03	479	4878	Maita et al., 1981
Zinc sulfate heptahydrate	100	Rat (*Rattus norvegicus*)	0/24.5/243/2486	mg/kg bw/d	FD	13	weeks	5	weeks	JV	female	ORWT	OV	2486		Yes	0.231	Yes	1.49E-02	2486		Maita et al., 1981
Zinc sulfate	100	Rat (*Rattus norvegicus*)	0/150	mg/kg diet	FD	17	days	100	days	GE	female	RSEM	WO		150	No	0.3846	No	3.13E-02		12.2	Kumar, 1976
Zinc	100	Rat (*Rattus norvegicus*)	0/1000	mg/kg diet	FD	10	days	NR	NR	GE	female	PROG	WO		1000	Yes	0.3945	No	3.20E-02		81.1	Barone et al., 1998
Zinc acetate dihydrate	100	Rat (*Rattus norvegicus*)	0/232	mg/kg bw/d	FD	16	days	NR	NR	GE	female	PROG	WO		232	No	0.229	No	2.05E-02		232	Newman et al., 2002
Zinc sulfate	100	Rat (*Rattus norvegicus*)	0/4000	mg/kg diet	FD	18	days	120-130	days	GE	female	GREP	WO		4000	No	0.3846	No	3.13E-02		326	Pal and Pal, 1987
Zinc	100	Rat (*Rattus norvegicus*)	0/0.4	% in diet	FD	14	days	NR	NR	LC	female	PRWT	WO		0.4	No	0.3846	No	3.13E-02		326	Chu and Cox, 1972
Zinc oxide	100	Rat (*Rattus norvegicus*)	0/0.4	% in diet	FD	22	days	NR	NR	GE	female	PRWT	WO		0.4	Yes	0.245	No	2.16E-02		353	Cox et al., 1969
Zinc oxide	100	Rat (*Rattus norvegicus*)	0/0.4	% in diet	FD	18	days	NR	NR	GE	female	PRWT	WO		0.4	Yes	0.0872	No	9.25E-03		424	Schlicker and Cox, 1968
Growth																						
Zinc Oxide	100	Water buffalo (*Bubalus bubalis*)	0/460.28/527.70/1072.50/1129.26	mg/org/d	FD	90	days	7-9	months	JV	male	BDWT	WO	1129.3		Yes	261	No	6.66E+00	4.33		Attia, et al., 1987
Zinc sulfate	100	Cattle (*Bos taurus*)	0/200	mg/kg diet	FD	50	days	18	months	JV	female	BDWT	WO	200		Yes	379	No	9.05E+00	4.78		Huerta et al., 2002
Zinc methionine	100	Cattle (*Bos taurus*)	0/200	mg/kg diet	FD	50	days	18	months	JV	female	BDWT	WO	200		Yes	379	No	9.05E+00	4.78		Huerta et al., 2002
Zinc acetate	100	Rat (*Rattus norvegicus*)	0/150	mg/kg diet	FD	5	weeks	NR	NR	JV	male	BDWT	WO	150		Yes	0.126	Yes	8.10E-03	9.64		Alaoui et al., 1985
Zinc oxide	100	Pig (*Sus scrofa*)	0/500/5000	mg/kg diet	FD	8	month	7-8	months	GE	female	GGRO	WO	500	5000	Yes	134	Yes	2.75E+00	10.3	103	Hill et. al., 1983
Zinc sulfate heptahydrate	100	Rat (*Rattus norvegicus*)	0/444/789/1701	ug/org/d	FD	12	days	NR	NR	JV	male	BDWT	WO	1701		Yes	0.145	No	1.40E-02	11.7		Weigarnd and Kirchgessner, 1978
Zinc oxide	100	Pig (*Sus scrofa*)	0/581	mg/kg diet	FD	16	weeks	6-8	weeks	JV	both	BDWT	WO	581		Yes	91	Yes	2.11E+00	13.5		Eisemann et al., 1979
Zinc carbonate	100	Rat (*Rattus norvegicus*)	0/120	mg/kg diet	FD	37	days	105	days	LC	female	BDWT	WO	120		Yes	0.3742	Yes	4.50E-02	14.4		Cerklewski, 1979
Zinc carbonate	100	Pig (*Sus scrofa*)	0/478	mg/kg diet	FD	4	weeks	NR	NR	JV	both	BDWT	WO	478		Yes	84	No	2.62E+00	14.9		Elliot and Walker, 1968
Zinc carbonate	100	Rat (*Rattus norvegicus*)	0/200	mg/kg diet	FD	7	weeks	NR	NR	JV	male	BDWT	WO	200		Yes	0.23	Yes	1.80E-02	15.7		Cerklewski and Forbes, 1976
Zinc sulfate	40.5	Rat (*Rattus norvegicus*)	0/0.44	g/kg diet	FD	3	weeks	NR	NR	JV	male	BDWT	WO	0.44		Yes	0.25	No	2.20E-02	15.7		Wapnir and Lee, 1993
Zinc oxide	100	Rat (*Rattus norvegicus*)	0/200	mg/kg diet	FD	14	days	9-10	weeks	SM	male	BDWT	WO	200		Yes	0.216	No	1.95E-02	18.0		Agarwal et al., 1986
Zinc sulfate	100	Mink (*Mustela vison*)	0/171/330	mg/kg diet	FD	4	month	90	days	JV	male	BDWT	WO	330		Yes	1.9	No	1.16E-01	20.2		Brandt, 1983
Zinc oxide	100	Rat (*Rattus norvegicus*)	0/400	mg/kg diet	FD	120	days	40	days	JV	female	BDWT	WO	400		Yes	0.2779	Yes	2.01E-02	28.9		Shankar et al., 1986
Zinc carbonate	100	Rat (*Rattus norvegicus*)	0/350	mg/kg diet	FD	7	weeks	3	weeks	JV	male	BDWT	WO	350		No	0.267	No	2.32E-02	30.4		Reeves and Newman, 1997
Zinc sulfate	100	Cattle (*Bos taurus*)	0/1264.0	mg/kg diet	FD	4	weeks	NR	NR	LC	female	BDWT	WO	1264		Yes	623.2	Yes	1.51E+01	30.6		Gaynor et al., 1988
Zinc chloride	100	Cattle (*Bos taurus*)	0/1386.4	mg/kg diet	FD	5	weeks	NR	NR	LC	female	BDWT	WO	1386.4		Yes	626.2	Yes	1.50E+01	33.2		Gaynor et al., 1988
Zinc acetate	100	Rat (*Rattus norvegicus*)	0/34	mg/kg bw/d	FD	4	days	NR	NR	GE	female	BDWT	WO	34		Yes	0.275	No	2.38E-02	34		Khera and Shah, 1979
Zinc chloride	100	Rat (*Rattus norvegicus*)	0/500	mg/kg diet	FD	8	weeks	3	weeks	JV	female	BDWT	WO	500		Yes	0.319	No	2.69E-02	42.1		Evenson et al., 1993
Zinc carbonate	100	Pig (*Sus scrofa*)	0/0.05/0.10/0.20/0.40/0.80	% in diet	FD	42	days	NR	NR	JV	NR	BDWT	WO	0.1	0.2	Yes	47.99915	Yes	2.09E+00	43.5	87.1	Brink et al., 1959
Zinc sulfate	100	Cattle (*Bos taurus*)	0/1000/2000	mg/kg diet	FD	14	weeks	NR	NR	LC	female	BDWT	WO	2000		Yes	565	Yes	1.80E+01	63.7		Miller et al., 1989
Zinc	100	Rat (*Rattus norvegicus*)	0/56	mg/kg bw/d	FD	2	weeks	NR	NR	JV	male	BDWT	WO	56		Yes	0.1728	No	1.62E-02	56		Reeves et al., 1994
Zinc sulfate	100	Pig (*Sus scrofa*)	0/3000	mg/kg diet	FD	10	weeks	NR	NR	JV	male	BDWT	WO	3000		Yes	61.3	No	2.02E+00	99.1		Van Vleet et al., 1981
Zinc oxide	100	Pig (*Sus scrofa*)	0/236/572/762	mg/d	FD	2	weeks	23	days	JV	both	BDWT	WO	762		Yes	7.4	Yes	2.60E-01	103		Schell and Kornegay, 1996
Zinc sulfate	100	Pig (*Sus scrofa*)	0/218/624/830	mg/d	FD	23	days	23	days	JV	both	BDWT	WO	830		Yes	7.82	Yes	3.40E-01	106		Schell and Kornegay, 1996
Zinc chloride	100	Mouse (*Mus musculus*)	0/110.2	mg/kg bw/d	FD	13	weeks	12	weeks	JV	male	BDWT	WO	110.2		Yes	0.000042	No	1.91E-05	110		Anderson et al., 1993
Zinc sulfate heptahydrate	100	Rat (*Rattus norvegicus*)	0/23.2/234/2514	mg/kg bw/d	FD	13	weeks	5	weeks	JV	male	BDWT	WO	234	2514	Yes	0.43	Yes	2.36E-02	234	2514	Maita et al., 1981
Zinc carbonate	100	Rabbit (*Oryctolagus cuniculus*)	0/1000/5000	ug/g	FD	22	weeks	NR	NR	JV	both	BDWT	WO	5000		Yes	3	No	1.69E-01	282		Bentley and Grubb, 1991
Zinc carbonate	100	Golden hamster (*Mesocricetus auratus*)	0/3000	mg/kg diet	FD	18	weeks	NR	NR	JV	male	BDWT	WO	3000		No	0.134	No	1.32E-02	295		Llewellyn et al., 1985
Zinc sulfate heptahydrate	100	Mouse (*Mus musculus*)	0/42.7/458/4927	mg/kg bw/d	FD	13	weeks	5	weeks	JV	male	BDWT	WO	458	4927	Yes	0.0453	Yes	6.00E-03	458	4927	Maita et al., 1981
Zinc oxide	100	Rat (*Rattus norvegicus*)	0/0.2/0.5	% in diet	FD	14	days	NR	NR	LC	female	BDWT	WO	0.5		Yes	0.252	Yes	2.37E-02	470		Ketcheson et al., 1969
Zinc sulfate heptahydrate	100	Mouse (*Mus musculus*)	0/46.4/479/4878	mg/kg bw/d	FD	13	weeks	5	weeks	JV	female	BDWT	WO	479	4878	Yes	0.0446	Yes	4.16E-03	479	4878	Maita et al., 1981
Zinc carbonate	100	Rat (*Rattus norvegicus*)	0/0.75	% in diet	FD	18	weeks	NR	NR	JV	male	BDWT	WO	0.75		Yes	0.438	No	3.49E-02	597		O'Neil-Cutting et al., 1981
Zinc oxide	100	Mouse (*Mus musculus*)	0/6010	mg/kg diet	FD	10	days	8	weeks	JV	female	BDWT	WO	6010		Yes	0.0205	No	2.81E-03	825		Zhang et al., 1995
Zinc sulfate	100	Mouse (*Mus musculus*)	0/6075	mg/kg diet	FD	10	days	8	weeks	JV	female	BDWT	WO	6075		Yes	0.019	No	2.64E-03	845		Zhang et al., 1995
Zinc methionine	100	Mouse (*Mus musculus*)	0/6135	mg/kg diet	FD	10	days	8	weeks	JV	female	BDWT	WO	6135		Yes	0.02	No	2.76E-03	846		Zhang et al., 1995
Zinc chloride	100	Mouse (*Mus musculus*)	0/10/20	g/kg diet	FD	3	weeks	4	weeks	JV	both	BDWT	WO	10	20	Yes	0.017	No	2.41E-03	1419	2838	Pettersen, et al., 2002
Zinc carbonate	100	Rat (*Rattus norvegicus*)	0/30	mg/g diet	FD	42	days	NR	NR	JV	male	BDWT	WO	30		Yes	0.253	Yes	1.42E-02	1684		Urabe and Hayakawa, 1990
Zinc sulfate heptahydrate	100	Rat (*Rattus norvegicus*)	0/24.5/243/2486	mg/kg bw/d	FD	13	weeks	5	weeks	JV	female	BDWT	WO	2486		Yes	0.231	Yes	1.49E-02	2486		Maita et al., 1981
zinc acetate	100	Rat (*Rattus norvegicus*)	0/200	ug/g	FD	11	weeks	NR	NR	JV	female	BDWT	WO		200	Yes	0.1838	Yes	8.00E-03		8.71	Nakamura et al., 1983
Zinc carbonate	100	Sheep (*Ovis aries*)	0/1000	mg/kg diet	FD	56	days	NR	NR	SM	male	BDWT	WO		1000	Yes	74.4	Yes	1.20E+00		16.1	Rosa et al., 1986
Zinc oxide	100	Rat (*Rattus norvegicus*)	0/400	mg/kg diet	FD	6	weeks	NR	NR	JV	male	BDWT	WO		400	Yes	0.198	Yes	1.40E-02		28.2	Subramanian et al., 2000
Zinc sulfate	100	Sheep (*Ovis aries*)	0/2065	mg/kg diet	FD	26	days	1	weeks	JV	male	BDWT	WO		2065	No	34	No	1.25E+00		75.7	Davies, et al., 1977
Zinc	100	Rat (*Rattus norvegicus*)	0/1000	mg/kg diet	FD	10	days	NR	NR	GE	female	BDWT	WO		1000	Yes	0.3945	No	3.20E-02		81.1	Barone et al., 1998
Zinc oxide	100	Pig (*Sus scrofa*)	0/4000	mg/kg diet	FD	13	weeks	4	weeks	JV	NR	BDWT	WO		4000	Yes	64.92	Yes	1.45E+00		89.1	Hsu et al., 1975
Zinc oxide	100	Rat (*Rattus norvegicus*)	0/0.4	% in diet	FD	18	days	NR	NR	GE	female	BDWT	WO		0.4	Yes	0.0872	No	9.25E-03		424	Schlicker and Cox, 1968
Zinc carbonate	100	Rat (*Rattus norvegicus*)	0/0.75	% in diet	FD	5	weeks	4-6	weeks	JV	male	BDWT	WO		0.75	No	0.235	No	2.09E-02		667	Settlemire and Matrone, 1967
Zinc carbonate	100	Rat (*Rattus norvegicus*)	0/1	% in diet	FD	15	days	NR	NR	JV	male	BDWT	WO		1	Yes	0.1558	No	1.49E-02		956	Ogiso, et. al., 1974
Zinc carbonate	100	Rat (*Rattus norvegicus*)	0/0.75	% in diet	FD	1	weeks	NR	NR	JV	male	BDWT	WO		0.75	Yes	0.029	No	3.74E-03		968	Scott and Magee, 1979
Survival																						
Zinc sulfate heptahydrate	100	Sheep (*Ovis aries*)	0/223/409	mg/kg diet	FD	98	days	NR	NR	JV	male	MORT	WO	409		No	34	Yes	1.00E+00	12.0		Van der Schee et al., 1980
Zinc carbonate	100	Pig (*Sus scrofa*)	0/0.05/0.10/0.20/0.40/0.80	% in diet	FD	42	days	NR	NR	JV	NR	MORT	WO	0.1	0.2	Yes	47.99915	Yes	2.09E+00	43.5	87.1	Brink et al., 1959
Zinc oxide	100	Sheep (*Ovis aries*)	0/0.5/1.0/1.5/2.0/2.5/3.0/3.5	g/kg diet	FD	6	weeks	NR	NR	JV	NR	MORT	WO	2.5	3	Yes	40.7	Yes	1.35E+00	82.9	99.5	Ott et al., 1966
Zinc oxide	100	Horse (*Equus caballus*)	0/5400	mg/kg diet	FD	9	weeks	3-4	weeks	JV	female	MORT	WO	5400		No	181.44	Yes	2.81E+00	83.7		Willoughby et al., 1972
Zinz sulfate heptahydrate	100	Mink (*Mustela vison*)	0/66.2/105.7/164.8	mg/kg bw/d	FD	144	days	>1	year	AD	male	MORT	WO	164.8		No	1.18	Yes	2.33E-01	165		Aulerich et al., 1991
Zinz sulfate heptahydrate	100	Mink (*Mustela vison*)	0/113.3/229.8/297.4	mg/kg bw/d	FD	144	days	10-12	weeks	JV	male	MORT	WO	297.4		No	1.02	Yes	2.69E-01	297		Aulerich et al., 1991
Zinz sulfate heptahydrate	100	Mink (*Mustela vison*)	0/104.3/227.5/323.6	mg/kg bw/d	FD	144	days	10-12	weeks	JV	female	MORT	WO	323.6		No	0.583	No	4.41E-02	324		Aulerich et al., 1991
Zinz sulfate heptahydrate	100	Mink (*Mustela vison*)	0/76.8/178.2/326.7	mg/kg bw/d	FD	114	days	>1	year	AD	female	MORT	WO	326.7		No	0.596	Yes	1.75E-01	327		Aulerich et al., 1991
Zinc sulfate heptahydrate	100	Mouse (*Mus musculus*)	0/42.7/458/4927	mg/kg bw/d	FD	13	weeks	5	weeks	JV	male	MORT	WO	458	4927	Yes	0.0453	Yes	6.00E-03	458	4927	Maita et al., 1981
Zinc sulfate heptahydrate	100	Rat (*Rattus norvegicus*)	0/24.5/243/2486	mg/kg bw/d	FD	13	weeks	5	weeks	JV	female	MORT	WO	2486		Yes	0.231	Yes	1.49E-02	2486		Maita et al., 1981
Zinc sulfate heptahydrate	100	Rat (*Rattus norvegicus*)	0/23.2/234/2514	mg/kg bw/d	FD	13	weeks	5	weeks	JV	male	MORT	WO	2514		Yes	0.371	Yes	2.13E-02	2514		Maita et al., 1981

Table F-1. Mammalian Toxicity Data

Chemical Form	MW%	Test Species	Conc/ Doses	Conc/Dose Units	Route of Exposure[a]	Exposure Duration	Duration Units	Age	Age Units	Lifestage[b]	Sex	Effect Measure[c]	Response Site[d]	Study NOAEL	Study LOAEL	Body Weight Reported	Body Weight (kg)	Ingestion Rate Reported?	Ingestion Rate (kg or L/day)	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Reference
Zinc sulfate heptahydrate	100	Mouse (*Mus musculus*)	0/46.4/479/4878	mg/kg bw/d	FD	13	weeks	5	weeks	JV	female	MORT	WO	4878		Yes	0.0327	Yes	3.60E-03	4878		Maita et al., 1981
Zinc sulfate	100	Pig (*Sus scrofa*)	0/3000	mg/kg diet	FD	10	weeks	NR	NR	JV	male	MORT	WO		3000	Yes	61.3	No	2.02E+00		99.1	Van Vleet et al., 1981

MW = molecular weight
NR = Not Reported
a. DR = Drinking water; FD = food; OR = other oral
b. AD = adult; GE = gestation; IM = immature; JV = juvenile; LC = lactation; SM = Sexually mature; MA=mature; YO=young; MU=multiple
c. BDWT = Body wt changes; DEYO= Development of young; FERT = fertility; GDPV = general development; GGRO=general growth; GDIX=gestation index; GMOR=general mortality; GMPH=general morphology;GREP=general reproductive effect;LFSP=lifespan;MORT=mortality;MUSC=muscle changes; ODVP=offspring development;ORWT=organ weight changes;PRFM=sexual performance;PROG=progeny numbers/counts;PRWT=progeny weight;RBEH=reproductive behavior changes;RHIS=reproductive organ histology;RPRD=reproductive capacity;RSEM=resorbed embryos;RSUC=reproductive success;SPCL=sperm cell counts;SPCV=sperm cell viability; SURV=survival;TDTH=time to death;TEDG=testes degeneration;TEWT=testes weight
d. BO = bone oviduct; EM=embryo;FM=Femur;GO=gonads;MT=multiple tissues; MU=muscle; NR=not reported; OV=ovary; PY=progeny; RT=reproductive tissue; SM=sperm; SV=seminal vesicle; TA=tail; TB=tibia; TE=testes; WO=whole organism

Table F-1 References

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